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The Manufacture of Wire Glass

as exemplified by patented inventions

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SHEET glass having wire or wire gauze embedded in it is especially applicable for use in skylights, conservatories, vaults, floorlights, railroad cars and in all structures where strength is required or where the sash is in such position that if the glass should break it would be liable to injure persons passing. For instance, if the glass is used in skylights in railway depots or trainsheds the wire embedded in the glass would prevent particles of glass from falling if it should crack, and at the same time the glass protects the wire netting from the action of gases, which corrode the wire.

Nearly two hundred patents have been granted for inventions relating to the manufacture of wire glass. Although the structure of wire glass is very simple, many problems and difficulties have been encountered in its commercial manufacture. The difference in the thermal expansion of the glass and wire for instance, has been a source of trouble. Another difficulty in making wire glass is the elimination of bubbles in the final product. The impurities on the surface of the wire and gases in the metal often causes defects in the finished glass.

Defects Caused by the Wire

Sheets of wire used for making wire glass show rust spots in more or less numbers should they be kept for a few days or even hours between the time the wire is woven and the time of its being used in the manufacture of wire glass. These rust spots show themselves in the glass in a marked degree, owing to the fact that when the wire is first embedded in the hot or molten glass, it becomes heated to the temperature of the glass, and as there is a severe strain on it as the hot glass pressed by the rollers drags over the wire meshes the rust on the wire will, as it were, loosen its hold on the metal and stain the glass, causing what is known as "moss spots" thereby producing a disfigurement in the sheet of wire glass that is objectionable.

According to patent No. 646,132, dated March 27, 1900, to Sheppard, the manufacturers of wire glass have coated the wire with various metals and other substances, but in each case the material used in the coating of the wire lets go its hold on the metal when the wire is heated, and its surfaces are subjected to the strain and rubbing of the glass as it is being pressed into shape between the rollers, and the result is the production of the objectionable smudge of moss spots, though in much larger quantity with the metallic-coated wire than with the wire showing its natural surface, even though it be rusted in spots. Therefore the idea of preserving the woven wire sheets from rust by a metallic coating has been discarded.

The manufacturers then finding they were forced to use wire that shows its natural surface directed their attention to devise means to protect it from rust which was caused by moisture, either in the atmosphere or by moisture of the hands of the men who handled the wire. With this idea in view they have forced the men who attended the machines that wove the wire to wear gloves, so there should be no possibility of the bright wire being affected by the moisture from the hands; but this precaution has proved to be unavailing as far as rust spots were concerned, as it was found the atmosphere affected the wire at all times more or less, but at certain seasons of the year more than at others. To meet this obstacle, the wire when woven and in rolls was incased in paper or cloth and kept in dry rooms or shipped in dry cars, but all to no avail. The moss or smudge spots appear in so much of the glass as to make a serious item of expense in its manufacture, as the sheets that have much of this disfigurement are an unmarketable product.

Coating the Wire

The invention of patent 646,132 consists in taking the woven wire as it comes from the weaving machine and coating it with a covering of lime. This can be done by

either sifting dry lime over the rolls of woven wire or the rolls can be dipped in a thick solution of lime and water, the latter being preferable. Should the rolls be dipped, then they should be immediately dried in an oven. In either case the rolls of woven wire should be protected by a covering of cloth or paper, and in this condition they can be kept for any length of time without the fear of any rust spots appearing on the wire, as the lime will absorb the moisture that comes in contact with it. When the wire is to be used it is thoroughly washed in water and dried, and then embedded in the glass.

The invention of patent No. 533,512, dated February 5, 1895, to Walsh, consists in embedding wire mesh in one side of the plate of glass during the process of rolling, the wire mesh having been previously treated, so that the finished article, after being annealed, is a plate of glass in which is embedded a wire mesh, the latter being covered by a material which has been fused with glass, the coefficiency of expansion of the material being about equal to that of the wire mesh. A plate of glass so prepared and having the qualities described will permit the glass to expand and contract under varying temperatures without danger of cracking, the wire mesh embedded in the plate of glass being permitted a slight play due to the elasticity of the material with which it was covered before being embedded in the sheet, the material having become, in the process of manufacture, homogeneous with the plate of glass.

The coating referred to consists of one hundred parts sand, twenty-seven parts limestone and twenty parts borax, which is melted into glass form. The product of this is ground finely, or pulverized, and mixed with a suitable adhesive volatile vehicle, preferably turpentine. The wire mesh is dipped into or painted with this compound, and is ready to be embedded.

Wrapping Wire With Asbestos

Patent No. 524,936, dated August 21, 1894, to Croskey and Locke, wraps asbestos about the wire before it is embedded in the glass. It is claimed that the wire will adhere better to the glass in which it is embedded than will metallic wire and will be less liable than the latter to crack the glass through inequality of expansion and contraction.

Ornamental Wire Glass

The common type of wire glass, in which a netting or metallic trellis is embodied in the glass to act primarily as a reinforcement, has proven satisfactory for use as window panes in various places where an ornamental appearance is not particularly desired, or at least, is not important. Several attempts have been made to render the sheets or panes sufficiently ornamental and attractive in appearance to secure their extensive use in banks, offices and other places where an attractive appearance, in addition to the well known useful properties may be desired.

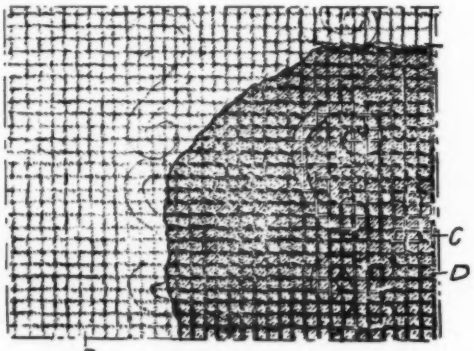


Fig. 1.

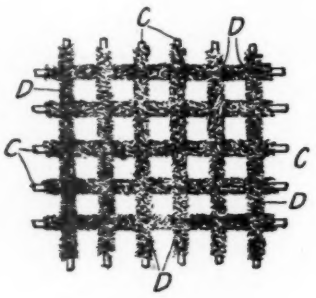


Fig. 2.

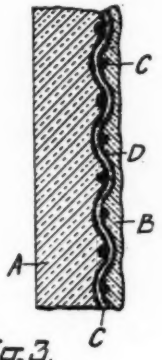


Fig. 3.

PAT. NO. 1,187,346

A lace curtain effect has been produced in a sheet of glass in which there is embedded an open mesh fabric such as wire netting, covered wholly or in part with a fireproof, loose, fluffy material such as asbestos fibers, arranged according to a predetermined design such as that of a lace curtain to produce a lace curtain effect.

As shown in patent No. 1,187,346, dated June 13, 1916, to Lea, the pane consists essentially of a sheet of glass formed of two layers A and B, between which is embedded an open mesh fabric C, preferably wire netting, covered in whole or in part along its members with loose, fluffy asbestos fibers. The loose material D, is arranged according to a predetermined design, such, for instance, as that of a lace curtain, as indicated in Fig. 1. In practice, the layer A is the main or outer layer while the layer B is the covering or inner layer and is very thin in comparison with the main layer A. By this arrangement the wire netting C and its loose material D is located near one face of the sheet glass, that is, near the inner face of the sheet, in case the sheet is used as a window pane. By the arrangement described, a person inside of a room can readily look through the pane of glass to the outside, but a person standing on the outside cannot look through the window pane into the room. To the person on the outside the loose material presents a lace curtain effect.

In the manufacture of the pane, a batch of molten glass is dumped onto a table to approximately the thickness of the layer A and then the wire netting C with its covering material D is placed on top of this glass, after which another layer of molten glass is placed on top of the wire netting and is rolled down by the use of a suitable roller so that the glass passes through the meshes or interstices of the wire netting

C and its covering to unite with the glass of the first bath, that is the layer A. The outer surface of the covering layer B is preferably left undulating or rough, thus aiding the covering material and the wire netting in preventing a person from looking through a pane from the outside.

Attaching Ornaments to the Wire

A recent patent No. 1,241,767, dated October 2, 1917, to Richter, uses the wire mesh as a ground work or support for the elements going to make up the design. These elements may be small objects in the form of plates, sheets or disks, and cut, stamped of any desired contour. The desired number of these objects may be secured to the wire mesh so as to form letters, numerals, symbolic designs, or arranged in accordance with any predetermined pattern. They may be secured to the wire mesh in any suitable manner, preferably by means which will not be affected by the temperature of the molten glass. The wire mesh may be of the ordinary form with hexagonal apertures, or may be of any other desired form suitable for supporting and properly positioning the elements of the pattern. The wires themselves or certain particular wires may be rendered conspicuous by their larger size or by a coating so as to form a part of the design itself, or the wires may be made so small as to be inconspicuous to the casual observer. In fact, the wires may serve solely as the means for supporting, introducing and positioning the elements of the design within the glass and may largely, if not entirely, lose their reinforcing function.

In Fig. 1 (cut 2) is shown a wire mesh 10 formed of a series of wires, all extending in the same general direction. Each wire has portions twisted together with portions of the adjacent wires so as to form hexagonal apertures. The wire may be of any suitable material and may be finished either dull or polished, depending upon the conspicuousness desired. It may also be of finer or greater size, depending upon

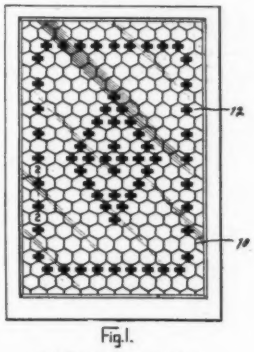


Fig. 1.
PAT. NO. 1,241,767

the thickness of the glass and also the desired strength and conspicuousness. Upon this wire mesh is arranged a series of units or elements going to make up the body of the design. These are shown as small metal plates 12, each in the form form of a Greek cross and each with its upper and lower extremities 13 bent over to lie parallel with the body portion and to grip the wire and hold the plate in position. The plates are shown as being superposed upon certain of the twisted portions of the wire but it is of course evident that they may be secured to any other portion of the wire mesh.

The First Method of Making Wire Glass

One of the earliest methods of making wire glass is described in patent No. 220,908, dated October 28, 1879, to Arbogast, consisted in placing a sheet of glass in a mold, then laying on top of this sheet a number of wires and then covering them with another sheet of glass. The assembly is then consolidated by heat and pressure into a homogeneous mass.

Present Day Methods

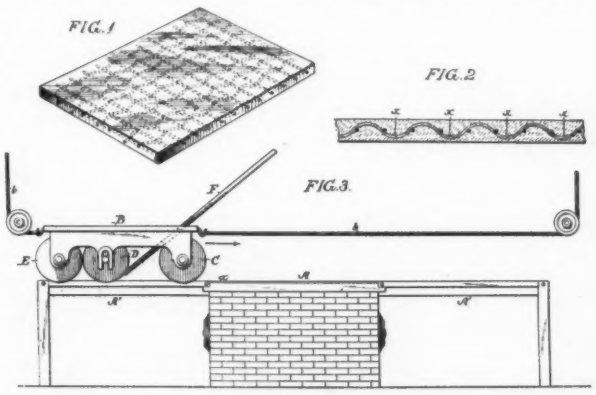
There are two separate and distinct processes used in the manufacture of wire glass, one known today as the "solid" and the other known as the "sandwich" process.

The solid process consists in forcing the sheets of woven wire into the solid molten mass of glass by means of rollers of various patterns, one having ridges on its surface that not only force the sheets of woven wire into the mass of glass, but also allows the molten glass to be pressed up through the meshes, which immediately following flattens out, thus producing a sheet of wire glass that has the wire embedded between its surfaces.

The sandwich process consists in first rolling a sheet of glass upon the rolling table, laying in it the sheet of woven wire, and then rolling over it a second sheet of molten glass, the processes following so close to one another as to be almost simultaneous.

The Solid Process

The solid process for making wire glass is illustrated in the patent No. 483,021, dated September 20, 1892, to Shu-



PAT. NO. 483,021

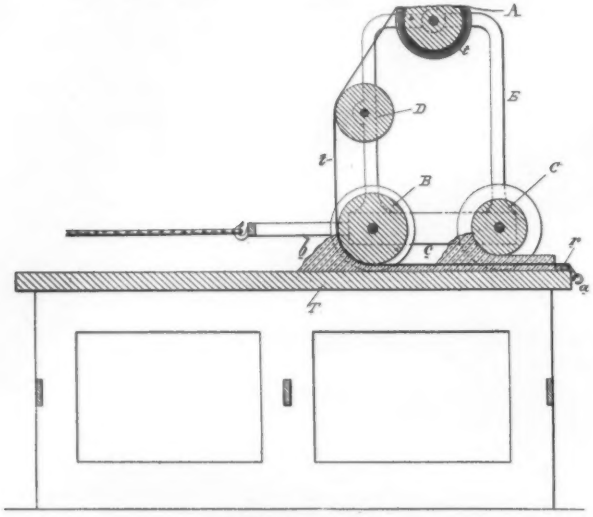
man. Referring to the drawings, A is the table for receiving the molten glass, and under it is a suitable furnace for heating the table to the proper temperature. On each side of the table are rails A^1. B is a carriage having three rolls C, D, and E, the rolls C and E supporting the carriage in the present instance, while the roll D is so mounted that it can move vertically within its bearings. The rolls C and D are plain rolls, while the roll D has a series of annular ribs, which act to press the wire or wire gauze into the molten glass. Directly in front of the roller D is an inclined chute F, upon which is placed the wire or wire gauze. Each roller

is hollow and is provided with a movable head, and adapted to each roller is a core, which can be heated to the proper temperature and placed within its roller. A rope or chain b is provided in the present instance to draw the carriage across the table.

In carrying out the process, sufficient molten glass is poured upon the table at the paint a. The carriage is then moved in the direction of the arrow, and the roller C smooths out the molten glass to the proper thickness, after which the wire or wire gauze is placed upon the molten glass and pressed into it by the roller D. The roller E follows the roller D and closes the opening made by the wire and the roller D. By this means a sheet of glass is rolled having embedded within it strips of wire or a sheet of wire gauze. By forming a series of annular ribs upon the roller D at certain distances apart, it is possible to corrugate the wire as shown in Figs. 1 and 2, the ribs making depressions in the wire at the points x, Fig. 2, and as the wire is pliable, being heated, it will yield at the points where pressed.

The Sandwich Process

The chief difficulties attending the solid process are that a netting of light wires, such as it is very important to use, so as not to impare the essential properties of transparency and limpidity could not be forced in that manner into the body of the glass and it is not easy by this method to embed



PAT. NO. 608,096

the netting regularly and at the proper uniform distance from the surfaces of the sheet.

To satisfy the various conditions which this manufacture requires, it is necessary, first, that the metallic trellis be introduced into the glass paste in a regular manner and at such distance from the surface of the sheet as may be determined upon beforehand, and second, that a trellis with wires as thin as possible and with a very large mesh should be employed, so as not to impare the transparency and solidity of the glass.

The sandwich process is characterized by the continuous and progressive formation of two layers of molten glass and the simultaneous introduction between them of the metallic trellis or network and the compression of the whole into a solid, uniform, and homogeneous body or sheet. The process is illustrated by patent No. 608,096, July 26, 1898, to Appert.

Referring to the drawing, one end a of the metallic netting is temporarily attached to the end of table T, upon which the glass is poured. This netting t is supported by a rule r, which supports it at the required distance from the surface of the table. Between roller A and the point of attachment a the netting is supported by a metallic roller B, which is provided with flanges turned to the proper thickness, corresponding to that to be given to the first layer of glass. Behind roller B and parallel with it is another pressure roller C, also supported on the table in a manner similar to roller B, but at a sufficiently greater distance from the table T to give the finished sheet its proper thickness.

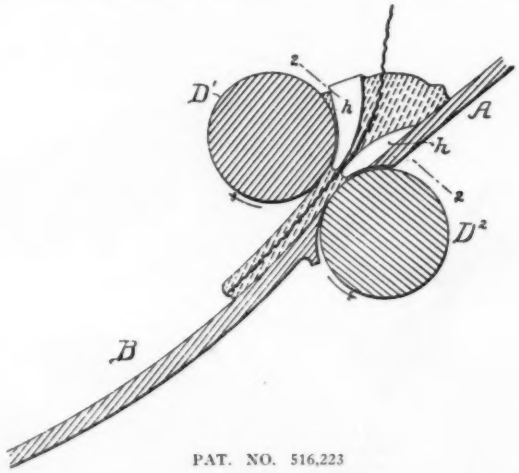
Roller C is placed at a distance from roller B such that the melted glass may be poured from a ladle or crucible between them. This distance may vary according to the nature of the glass employed and according to the thickness of the sheet, but that distance once determined for a particular product should be maintained during its entire manufacture.

In operation, one end of the netting is attached to the table. The portion of the netting between the spool and point of attachment is supported by a tension roller D and passes under roller B at the proper distance from the table. The rollers B, D, and C, are carried by frame E, which is, in operation, moved over the surface of the table. The rolling being performed, the wires which attach the netting to the table are quickly severed, and the whole sheet is carried immediately to the annealing furnace, where it is reheated to the annealing point in the usual way.

For a second operation the spool is replaced by another and brought to a proper tension. The operation then proceeds as before.

Drawing the Glass and Embedding the Wire Simultaneously

Another typical process embeds the wire netting in the glass before it is rolled into a sheet. This process is illus-

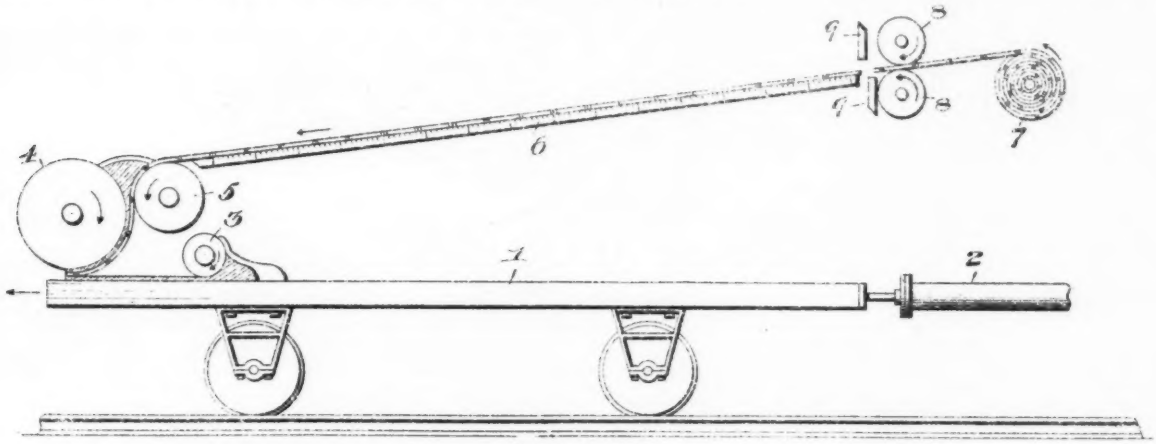


PAT. NO. 516,223

trated by patent No. 516,223, dated March 13, 1894, to Parker.

Two pressing rollers, D^1, D^2 are used, which may be ad-

justed at such distance from each other as may be necessary to form a required sheet. Over the lower roller, D^2, of the pair is an inclined table, A, which with the upper roller forms a hopper or receiver into which the molten glass is poured, and on the opposite side is a receiving table, B, having a curved upper surface arranged to receive the resultant sheet. The wire gauze is guided centrally into the rollers, by fixed guides, h, provided rigidly to the framework in front of one or both of the rollers, D^1, D^2, at each end. Additional guides may be employed in the length of the rollers. The guides are preferably curved, as shown in the drawings, and quite thin to prevent as little displacement of glass as possible. In operation the sheet of wire gauze is passed into the rollers, D^1, D^2, in such manner as to be positively guided centrally between the rollers, and as they revolve the wire netting is gradually fed through. After the starting of the netting the molten glass is poured onto the table, A, from the ladle, or other vessel, from which it flows, or is drawn between the rollers and formed around the netting, the netting being firmly embedded within the now formed sheet of glass as it emerges on the opposite side of the rolls.



PAT. NO. 741,125

Simultaneously Forming and Uniting the Sheets

In the invention of patent No. 741,125, dated October 13, 1903, to Franzen, the two sheets or layers are formed separately and simultaneously and are continuously united at a point or line substantially equidistant from the places of formation. The result claimed is that the layers are of substantially equal temperature, their conditions are practically the same, and the resultant product is of a high degree of excellence.

Referring first to Fig. 1, a movable casting table 1 is illustrated, which can be reciprocated by any suitable means—as, for instance, a hydraulic motor 2. Located above the table is a primary sheet-forming roller 3, that is revoluble, but relatively stationary with respect to the table. This roller is placed above the table a distance equal to the thickness of the first layer or sheet. Located in rear of the roller 3 is a uniting roller 4, that is also revoluble, but held against longitudinal movement with the table. The distance between this roller and the table is equal to the thickness of the finished sheet of glass. Arranged in rear of the roller 4 and some distance above the table is a secondary sheet-forming roller 5, revoluble with the roller 4 and being spaced therefrom a distance equal to the thickness of the secondary layer or sheet. A suitable inclined chute 6 is located above the table 1 and extends to a point above the roller 5. In rear of this chute is placed the wire reel 7, and interposed between the rear end of the chute and the reel are flattening and feed rollers 8, suitable cutters or shears 9 being disposed between the rollers 8 and the chute.

In the manufacture of a sheet of glass the wire netting is first unwound from the reel, being passed between the rollers 8, where the twists are flattened, so that there are no air-interstices formed therein. The flattened wire thus passes on to the chute, where it is cut off at the desired length by the shears 9, and the foremost end is entered between the rollers 4 and 5. The mechanism is then ready to receive the metal. Two batches of molten glass are simultaneously and respectively teemed between the rollers 4 and 5 and upon the casting table in rear of the roller 3. At the same time the table is advanced and the rollers revolved. The two sheets or layers of glass will be simultaneously formed at separate points, the primary sheet being formed between the roller 3 and the casting table and the secondary sheet being formed between the rollers 4 and 5. The wire netting will be embedded in the under face of the secondary sheet. As the mechanism continues to operate the two layers will come together beneath the uniting roller 4, and this line of uniting is located substantially equidistant from the formation of the first and second layers. The layers passing under this uniting roller will be thoroughly welded together and incorporated into a single sheet, with the wire located therein.

The Schmertz Process

In the solid process, the glass is poured upon the usual casting bed and a roller is pulled over it, developing a sheet of glass of substantially the thickness of the final product. Back of this roller, which is termed the "smoothing roller," wire gauze is fed upon the top of the sheet thus formed from a chute. A second corrugated roller now passes over the wire gauze and the sheet of glass and by its ribs deeply indents the wire gauze in the body of the sheet. A third smooth fin-

ishing roller now travels over the sheet thus corrugated and gives a finish to the top of the sheet. Some of the objections to this method are these. The action of the three rollers chills the top surface of the glass excessively before it can be transferred to the annealing kiln. The result is that the glass becomes unduly hard and is difficult to cut. It is a serious task to cut wire glass when made under the best conditions, and this extra hardening aggravates the situation. Another and more important objection to the method just described lies in the rough top surface produced. The first or leading roll gives a smooth finish to the top of the glass, but this is immediately ruined by the passage of the corrugated roll in the operation of forcing the wire down into the body of the sheet. This smooth finish is never regained, for although the third roller will efficiently smooth down any elevations on the surface of the glass it will not perfectly transfer the surplus glass to the depressions and fill them up with a perfect weld. An examination therefore of glass made by this process will, it is asserted, disclose fine channels running across the surface which has been uppermost in the process. These channels roughen the surface, making it ap-

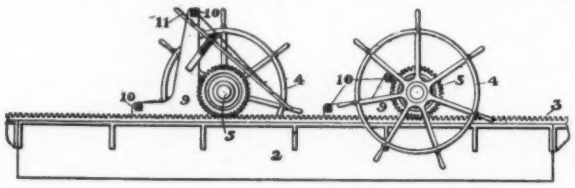


Fig. 1.

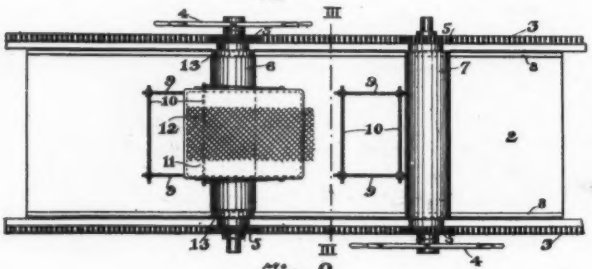


Fig. 2.

PAT. NO. 791,217

pear dull and lusterless, and greatly impair its appearance. The uneveness of the surface again adds to the trouble in cutting the article, as the diamond will not transverse it with the same ease as a polished surface.

Referring to the drawing as shown in the patent to Schmertz, No 791,217, May 30, 1905, 2 is the ordinary casting table, having the usual racks 3,3 on its longitudinal edges. Numerals 4,4 indicate the hand-wheels, which by pinions 5,5 advance the leading roll 6, which may be either smooth or corrugated, and secondary roll 7. These rolls rest upon tracks 8,8 and preferably one-fourth inch in height, and determine the thickness of the glass, subject to a special provision in the leading roll to be described.

9,9 are the guides which fix the width of the sheet and are pushed ahead by the rolls. 10,10 are the rods connecting the right and left hand guides. The mechanism thus far described is old and well known. 11 is a chute for wire 12, located at the rear of the first roll. The leading roll 6 has its ends 13,13 recessed, one-eighth of an inch, so that the body of the roll is left one-eighth of an inch above the bed of the table, while the body of the second roll is one-fourth of an inch above the bed so as to make the first sheet about one-half the thickness of the resulting product.

The operation of the device is as follows: A ladleful or suitable amount of glass is poured upon the table in advance of the leading roll and the leading roll moved forward. In practice the leading end of the sheet thus formed is discarded as made of chilled glass. Therefore, the wire is not fed down the chute until the first roll has made a sheet of glass sufficiently long to project about eighteen inches back of the wire chute. At this stage the wire is fed down upon the top of the sheet and finally lies flat upon it. As the forward or dead end of the sheet of glass moves near the rear roll, a second casting is made upon the dead end so that the imperfect ends of the two sheets may coincide, and thus economize material. The rear roll advancing crushes down this second casting and forces it over and through the wire gauze, firmly welding the material in the second casting to the wire gauze and to the first sheet and firmly uniting the three component parts. A brilliantly polished top surface is imparted to the product by the passage of the second roll, and the wire is left in the center of the finished sheet, whose thickness will be the height of the rear roller above the bed of the table. The top sheet having only one roller traversing it will not become so chilled as where two or more rolls pass over it, and especially where one is a corrugated roll throwing the glass up in ridges.

(*To be continued*)

Stresses Importance of Sunlight

In an address to the National City Planning Conference at Buffalo, Lawrence Veiller secretary of the National Housing Association pointed out that a ray of sunlight "travels 93,000,000 miles to reach us and when it comes we throw away its most valuable properties." He stated that window glasses now in use in the majority of homes in the United States exclude all the benefits of the sun's ultraviolet rays. In the United States, he declared, our present haphazard architecture is largely disregarding the essential benefits of sunlight, permitting the erection of giant buildings which often darken acres of smaller structures about them. As a case in point he mentioned the Equitable Trust Building in New York. This huge structure, while it is itself equipped with special ultraviolet transmitting glass to secure the sunlight's benefits, casts a shadow one-fifth of a mile in length, completely enveloping an area of 7.59 acres.

Americans, he said, are just beginning to realize the value of sunlight—a fact that was recognized by the most primitive peoples. He told how, as early as 10 B. C., the City Council of Pompeii paid 3,000 sesterces compensation to those whose sunlight was affected by the erection of the city wall. He pointed out that since 1832 a law has been in effect in England ensuring plenty of sunlight in homes.

"It is provided," he said, "that if a window in a building has uninterruptedly enjoyed the access of light for a period of twenty years, that right becomes permanent. Two remedies are open to the man whose property is adversely affected by the erection of a building on an adjacent or neighboring property. He can sue for damages or he can seek an injunction preventing the erection of the building in question or compelling its being torn down to a point at which it will not interfere with his rights in light."

For dwelling houses, Mr. Veiller recommended that the minumum amount of sunshine available for each room should be one-half hour. To secure this amount he recommended the enlargement of window areas by at least 50 per cent, with ultraviolet transmitting glass as a necessity.

The Testing of Fuel Oil

as practiced in a well-known glass factory

By W. RONALD LESTER
Chemist, Maryland Glass Corporation

FUEL OIL is defined as any petroleum product used for the generation of heat in a fire box. In general it is any liquid or liquifiable petroleum product that is useless from the standpoint of recovering the volatile fractions.

The fuel oils in general use may be grouped into four classes; crude petroleum, distillate fuel oils, residual fuel oils and blended fuels.

CRUDE PETROLEUM: These are generally crude oils that have very little recoverable volatile constituents making them useless except as a fuel oil. Untopped crudes contain a small percentage of the light volatile fractions which lower the flash point and increase the fire hazard.

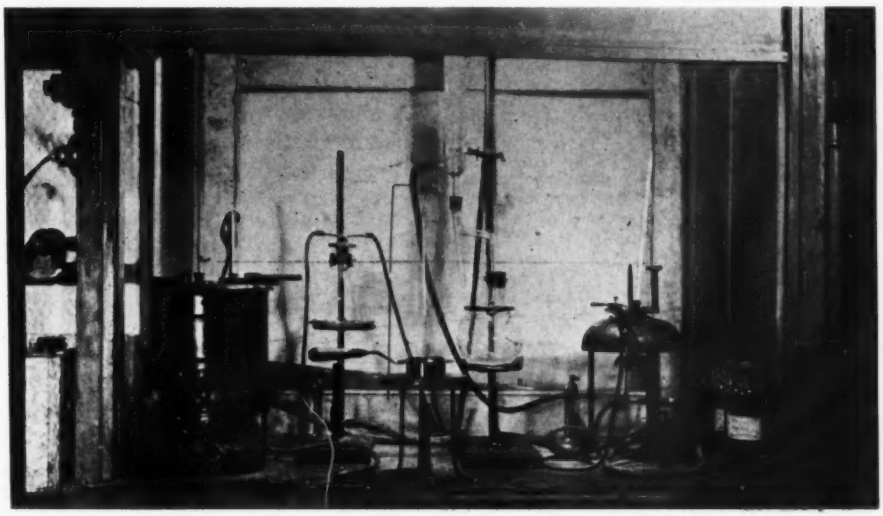
DISTILLATE FUEL OILS: These consist of the fractions distilled intermediate between kerosene and lubricating oils. being a distillation product they are free from heavy residual tars and salts.

RESIDUAL FUEL OILS: These usually are topped crudes or the viscous residual products obtained from crude petroleum by the removal of the valuable volatile hydrocarbons.

BLENDED FUELS: These consist of mixtures of any or all of the three other classes.

Any of the above groups can be used as a source of heat for the glass industry; the controlling factors being an adequate supply cost and the adaptability to existing conditions. For the firing of tank furnaces a heavy residual oil can be used successfully if the preheating temperature is kept both high and constant. In glass feeders either distillate oils or blended oils can be used.

With fuel oil, just as with other fuels, a constant check on their purity is required. In the testing of fuel oil the accuracy of the tests depends mainly upon the care taken in securing a representative sample. Fuel oil is shipped in tank cars and top, middle and bottom samples should be taken with a "car thief." These samples should be combined and thoroughly mixed to form the laboratory sample. The tests usually made on fuel oil are: Specific gravity, flash point, fire point, viscosity, moisture, sediment, sulphur, heating value and sometimes the cold test. All these are made according to the standard methods used by the Government. (Tech. paper 323 A, Dept. of the Interior).



1 2 3 4 5 6 7
1—Galvanized Iron Sample Box. 2—Saybolt Viscosimeter. 3—Sediment Apparatus. 4—Cleveland Open Cup. 5—Water Determination Apparatus. 6—Pensky-Martin Closed Cup. 7—Reagents.
FUEL OIL LABORATORY OF MARYLAND GLASS CORPORATION

The following are brief summaries of each method:

1. SPECIFIC GRAVITY: Fuel oil is bought on the Baume or A. P. I. basis and it is necessary to check the specific gravity of each shipment. For routine purposes it can be determined with a standard hydrometer at 60°F and recorded in either Be° or A. P. I°. For extreme accuracy the gravity should be taken with a Westphal balance and allowance made for the moisture content of the oil.

2. FLASH POINT: The flash point of an oil is that temperature at which it gives off inflammable vapors. For safety in handling, fuel oil should not flash below 150°F. The flash point is determined with the Pensky Martin closed cup tester in which the oil is heated in a vessel adjacent to a small flame. When the oil has been heated to a point where the vapor rises and is ignited by the flame the temperature is noted and recorded as the flash point. (Gov-

ernment method 110.21; A. S. T. M. method D 93-22).

3. FIRE POINT: The fire point of an oil is the temperature at which its ingredients will permanently burn. This point is taken with the Cleveland open cup tester. The oil is heated past the flash point to the point where it ignites and continues to burn for a period of five (5) seconds. The temperature being noted and recorded as the fire point. (Govt. method 110.31; A. S. T. M. method D 92-23 T).

4. VISCOSITY: The viscosity of an oil is a measure of its resistance to flow due to the internal friction. The viscosity is lessened by an increase in the temperature and this fact is made use of in the preheating of heavy oils. The viscosity of an oil is measured by determining the time required for a given amount of the oil heated to a constant temperature (122°F for fuel oil) to flow through a small opening. The test is made with a Saybolt Furol Viscosimeter. (Govt. method 30.4; A. S. T. M. method D 88-23T).

5. MOISTURE: Moisture is present in all oils either in a free state or combined as an emulsion. As moisture tends to hinder the full development of heat from the fuel, its determination is very important. Also, if a tank car or the steam coils used for heating the oil are leaky the oil will carry an excessive amount of moisture. The moisture in the oil is determined by distilling the sample with a volatile solvent (water free gasoline) and catching the condensed water in a graduated trap. (Govt. method 300.-11; A. S. T. M. method D 95-23 T).

6. SEDIMENT: Sediment is present in all oils to a small extent and if it is not removed by the use of centrifuges or strainers it will in time cause clogging of the burners and thus prevent the efficient burning of the oil. Sediment is determined by extracting a weighed portion of the oil in a Porous thimble with 90 per cent benzol and then weighing the residue. (Govt. method 300.2).

7. SULPHUR: Sulphur is objectionable in oil due to the corrosive action of the SO_2 formed in burning. Oils high in sulphur have been known to corrode the containing tanks and pipe lines. Sulphur is determined in the washings from the complete combustion of the oil in an oxygen or peroxide bomb by precipitation as Ba So_4. (Govt. method 520.21; A. S. T. M. method D 129-22 T).

8. HEATING VALUE: The approximate heating value of fuel oil in B. T. U. per pound may be found by using the following empirical formula:

B. T. U.=18,650+40 (Baume°—10)

The most accurate method is by the use of the calorimeter. For commercial work the Parr calorimeter is quite satisfactory.

9. COLD TEST: The cold test shows the temperature at which the oils become pasty due to the crystallization of paraffin or other material. This test determines whether or not an oil will flow, without preheating, through pipe lines in cold weather. This test depends entirely upon the climate. (Govt. method 20.11; A. S. T. M. method D 97-22 T).

Protecting the Color Dress *of the glass container*

By WALDON FAWCETT

THE color of the bottle is becoming of tremendous importance to a considerable proportion of the bottle users in industry. More important, that is to say, than the size or shape of the bottle. So, too, with jars, tubes and other glass containers, which serve as carriers in the distribution of branded merchandise to ultimate consumers. For some years past, packers using other classes of containers have grown increasingly color-conscious. Thus it was inevitable that those who market their wares in glass packages should, in sympathy, become sensitive on this same score.

Several influences in the field of business at large have combined to produce this new deference to color. These persuasives are worthy the study of the practical men in the glass industry because they are likely to have a far reaching effect not only upon the character of the demand for glass containers but likewise upon the volume of this demand. It will be futile to urge the forces of commerce to "pack in glass" unless the glass package, in its various versions, may be accommodated to the necessities, the whims, and the fashions of modern packaging.

First of the influences to summon color to the glass package is the rapid increase, these past few years, in the practice of trade-marking commodities of all kinds. Branding for customer-recognition has grown apace in all countries, but particularly in the United States. Here the pressure of competition, the development of advertising, the rise of the self-serve store, and a number of other incentives have applied pressure. Not forgetting the possibility that some day Congress will legalize resale price fixing on trade-marked goods and thereby confer special privilege upon traders who identify their wares. As a sequel to the primary impulse to trade mark, which first found expression in the mounting of labels and other "riders" on the goods, we have latterly the desire to make the package itself a self-contained trade mark. This is where the colored glass container comes in.

As the second of the conspiring factors we have the present-day enthusiasm in industry and on the part of the public at large, for color. The rainbow having been brought into all the homely phases of everyday life, not forgetting kitchen and bathroom appointments, it is assumed that the average citizen reacts to color in commodity selection. Hence the plot to capitalize color in the merchandise container as a clue to the origin and ownership of the wares and to their quality. It goes without saying that if color can be blown in rather than applied as a removable casing or wrapper the color enthusiast is especially happy.

A third, and highly constructive influence is the deepening realization that judicious introduction of color in the

glass container may be the means of contributing to the preservation of the contents, and, accordingly contribute to the satisfaction of the consumer. This aspect of the color complex has been focused by the outcome of the United States Government's recent comparative tests of 110 different types of retail tea packages. It was discovered, as readers doubtless know, that from the standpoint of retention of flavor, etc., glass is the ideal container for tea, if only means be found to protect the tea from the destructive effect of the chemical rays of the sun. To completely envelop a tea jar in opaque paper would be to sacrifice some of the "shelf value" or advertising value of the glass package. As an "escape" from this dilemma there has been suggested the container made from glass of amber or other color. This incident is, in a sense, restricted to a single trade, but it is serving in a broad way, to direct attention to the utilitarian possibilities of color in glass.

Instant Identification of Origin Wanted

With the surge to color has come a new form of demand, or at least, a new line of inquiry to manufacturers of glass containers. Customers and prospects have asked the supply houses to provide glass receptacles, so distinctive colorwise, that they may be made the subject of monopoly by the user and may be protected against imitation and infringement. In short, many a bottle or jar buyer wants to make the color of his container a private trade mark. And he looks to the outfitter in glass to accomplish it for him.

While a narrow view of his obligations might pronounce this question of property rights in color no responsibility of the glass producer, the conditions of trade and the latter day sense of service may make it desirable that he concern himself with the matter. Indeed, an advisory attitude is all but demanded by the recourse of merchants, chains, and jobbers to "own label" operations. To the extent that he supplies glass packages for proxy branding, the glass operator is in a sense a private-brander-to-the-trade, and must needs be primed on the part that color can play in individualizing goods packed in glass.

Under Federal law there are three forms of protection that must be considered when one sets out to find out to what extent color in glass may be entrenched as a good will asset. The language in designation of these forms has been so loosely used that confusion prevails in many minds as to what is what. One hears such expressions as "patenting a trade mark" and "trade marking a label." Worse yet, some optimists are under the delusion that all the several and separate mediums for the protection of industrial property may be employed at one and the same time to provide an overlapping or multiple-layer protection. The color invasion has made confusion worse confounded. Because a pioneer in the use of a certain color or combination of colors is apt to think that he is entitled to exclusive use of a hue or tint in the trade line where he "saw it first" and he resents its use by others.

First of the trio of forms of protection is trade mark registration,—the certification at the Patent Office at Washington of a name, symbol or device that identifies a given make of goods sold in interstate commerce. Second, is label copyrighting,—the entry of the tag, sticker or other label which describes goods and which is attached to the goods it describes. Number 3 is not a franchise but a remedy, i. e., the relief for unfair competition or unfair trading that is obtainable under the common law. The reader will grasp the essential difference between the two first safeguards and the third. Trade marking and labeling are species of insurance that are taken out as much to scare away possible trespassers as to bolster one's case in the event that it is necessary to resort to law. The unfair competition alternative is a means to correct trade confusion after substitution has actually set in.

The Available Means of Protection

Now let us see what can be done, via these three channels, to protect the color dress of the glass package. For various reasons which are probably familiar to our readers, the average cherisher of good will in business would prefer to trade mark his good will symbols. Even if the colored glass idea strikes him late in his business life it catches his imagination. He knows that, if the technical requirements are met, Uncle Sam has no objection to one trader making use of two or more different trade marks on the same goods at the same time. So why not pyramid a glass color-mark on top of the coined word, or whatever other trade mark has been used.

This brings us to our first severe bump. Color as such will not be accepted as a trade mark. The denial has shattered the hopes of many a marketer who supposed that a line of goods might be identified by the "blue bottle" or the "red vial." The reasoning back of this color denial is, however, sound enough. The Government takes the position that if it were to allow one color or color combination after another to be monopolized, it would be no time at all until all the colors would be fenced off and the great body of later-comers would be starved. So "mere" color, as the saying is, will not support a trade mark claim.

To soften this blow, Uncle Sam is ready at all times to grant official recognition to color expressed in a peculiar or particular form. The usual way to illustrate what is required in color translation is to say that a green cross, a blue star, a red crescent or an orange circle is a perfectly valid trade mark for the first adopter. This doctrine applied to glass containers does not leave much hope, then, for the colored container in its entirety. Even a bottle stopper or other closure daubed in distinctive color has a slim chance if the experts pronounce it a structural part of the container. But a container badge in contrasting color, —say a pink disc or a gold seal on a blue bottle should be admitted as a trade mark in good standing.

Just as the green of a green bottle or cut glass perfumery flagon is not an acceptable trade mark, according to the Federal rules, so too the name "Green Bottle" is open to challenge as being descriptive. No better luck need be expected via the label copyright route in coaxing Uncle Sam's sanction of a color monopoly. A label is something separate and apart from the article which it describes. All the inscriptions on a carton blank which, when set up, completely envelops a glass container, may be copyrighted as one label. But the color or shape of a glass unit may not be entered as a label for the contents of the glass receptacle

any more than a bottle color may be licensed as an exclusive trade mark for the bottle contents.

While Uncle Sam is thus so outwardly inhospitable to the idea of color as an exclusive feature of a glass container, there is protection for the color of the glass package in its own right. The U. S. courts will give it, whenever color confusion results in a glass container of a shadowing color being passed off in trade for the glass receptacle that originally took to that color as an expression of individuality and made the color familiar to the public. Thus the color raiment of a glass container may be a trade mark in fact if not in name.

What the Glass Container Manufacturer May Not Do

The Federal courts take the position that any maker or user of glass containers has a right to imitate the structural features of a glass package that is open to all, but imitation of "non-functional features" that tend to cause confusion in trade may be enjoined. Color, used for a decorative or identifying purpose, ranks as a non-functional feature that may be pre-empted. But right to color protection of this kind, as applied to any article of merchandise, depends upon priority of use. If a claimant cannot show that he was the first to use his chosen color, he has no standing in the courts to restrain other users of that color.

Disposition on the part of the Federal courts to interfere where echoing of color leads to confusion in trade will doubtless tend to encourage one of the later uses of color in glass packaging, viz., the employment of color for purposes of grade marking. When a manufacturer puts out his commodity in several grades, sizes, or qualities, or varieties of flavors, color in the package is the ideal means of signaling varietal distinctions. Color approximation by a later comer may be held as guilt of unfair competition even though differences in the shades of color could be discovered when the two are placed side by side. In any case of unfair competition, the protection which the courts will accord to color depends somewhat on whether color repetition by a later comer is attended by duplication of other container features such as shape, closure, etc.

Applications of Glass

to the Chemical and Allied Industries

By A. E. MARSHALL
Corning Glass Works

IN chronological histories of the arts and manufactures, glass is accorded a position amongst the few which originated so long ago that a more accurate dating than "prior to 3000 B. C." must await further archaeological discoveries.

The earliest glasses were opaque, or at best translucent, and it would seem probable that glass was an accidental or perhaps an intentional development of a type of glaze used on pottery.

As time went on, the technique of glass manufacture was improved and a measure of transparency achieved. Many of the examples of glass fabricated 4000 years ago show the characteristic transparency we have come to associate with the word glass.

Permanent transparency is a quality possessed by few materials, so that in earlier times mineral crystals such as quartz and fluorspar and some of the precious stones were the only other known substances having qualities of transparency. Even when we consider the additions synthetic processes have made in the last forty years to the list of commercially available materials, we find but few transparent substances.

Celluloid and certain condensation products are initially transparent, but are easily abraded and tend to become translucent rather than transparent. Transparent fused quartz does add a useful and permanent material to the brief list of transparent substances, but it is at present costly and capable of production only in a limited range of shapes and sizes.

Glass manufacturing, from earliest times until recent years, has been confined to uses involving visual transparency, or where artistic satisfaction was secured by the play of light through colored, translucent or transparent shapes.

Rosenhain,[2] some ten years ago, was evidently impressed with the great preponderance of uses based on transparency, for he says: "There can be no doubt that, in most of its practical applications, transparency is the fundamental and essential property which leads to the employment of glass in the place of either stronger or cheaper materials. . . . It is indeed hard to find any use to which glass is extensively put into which the function of transmitting light does not very largely enter . . . . the fact remains that well over 95 per cent of the glass used in the world is employed for purposes where the transmission of light is essential to the desired result."

The mental associations conjured up by the word glass are usually transparency, fragility, and perhaps surface hardness. The compilers of one of the current dictionaries have evidently some such associations—possibly that of a baseball going through a window—as they define glass as the "hard brittle transparent substance in windows."

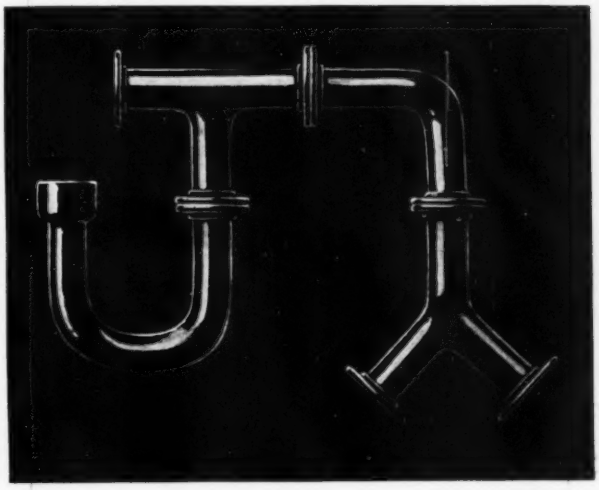
When a little more consideration is given to the properties of familiar ordinary glass articles, the list can be expanded to: transparency; mechanically weak except in compression; relatively hard surface; resistant to most acids; low thermal conductivity; moderate resistance to temperature changes; fairly effective as an electrical insulator.

With the exception of transparency the properties of ordinary glass demand the adjectival qualifications of relatively and moderately, and when they are considered as a group it is easy to understand the limitations of use which made Rosenhain's statement possible.

[1] A paper read at the annual meeting of the Society of Chemical Industry, New York, September, 1928.

[2] "Glass Manufacture" (2nd Edition), pp. 27—28 (1919).

It seems probable that such an outstanding characteristic as the transparency of glass has had a considerable influence on the stages of its development. Uses tended to center around transparency, and so improvements in this quality promised more immediate return than the discovery of



methods for altering and improving other properties, and so making glass available for purposes where transparency was not essential.

The industrial uses of glass, up to a few years ago, were based on transparency, and unless the glass in factory windows is included, the applications were practically confined to containers. One exception might be made in the case of the large glass flasks or retorts used, prior to the advent of planinum and the many present forms of pan and tower concentrators, for the concentration of chamber sulphuric acid. Chemical laboratories, of course, have always relied on glass apparatus, but, like the manufacturing operations of the alchemists, which were frequently carried out in glass equipment, the sizes and the operations do not justify inclusion as industrial uses.

One of the early suggestions of new uses for glass was due to De la Bastie, who announced in 1875 that he had discovered that glass could be tempered and toughened by plunging shapes or sheets heated close to the softening point into hot oil. The toughened product was said to possess extreme hardness, to be practically unbreakable, and to be adaptable for general construction purposes.

Unfortunately the extreme hardness was only case hardening; in fact, De la Bastie's glass articles were glorified Rupert's drops which disintegrated when they received the slightest fracture.

De la Bastie's process was adopted by various firms in France and England and also by Chapelle and Co., of Brooklyn, N. Y. The results were naturally unsatisfactory, and after numerous modifications had been attempted the Bastie process was abandoned, and it is now merely an interesting episode in the history of glass technology.

De la Bastie's announcement of his discoveries influenced other experimenters to study the possibility of tempering and strengthening glass, and Frederick Siemens, of Germany, worked out a slow-cooling process which depended on the withdrawal of heat from two parallel surfaces only. The Siemens process never came into general use, although Siemens in 1881 had visions of his glass as a new product capable of replacing many of the familiar construction materials A letter written by Siemens to J. D. Weeks[3] is worthy of reproduction as evidence of a changing viewpoint as to uses for glass, most of Siemens' proposals having no relation to transparency.

"Extensive works are about to be established in England for carrying out my process and for producing the glass to be tempered. These works will at the start comprise furnaces capable of producing 50 tons of glass per day . . . it being confidently expected that a large demand will arise for strong glass as a substitute for wood, brass, cast iron, stone, and other substances, in the condition of railway and tramway sleepers, gas, water, and drain pipes, eave troughs and gutters, mill-stones and crushers, tiles for roofing, facing walls and flooring, plates for floors of bridges, tanks and cisterns, ship lights, telegraph insulators, etc., for which applications tempered glass will offer the advantages of economy in first cost and greater durability over the materials now usually employed."

The processes of De la Bastie and Siemens were based on the idea that an improvement in the strength of ordinary glass would open up new fields of application. If there had not been the disadvantage of disintegration, when cut, deeply scratched, or fractured, probably some of the anticipated uses might have been realized, although the case-hardened product would be expected to be much less resistant to temperature changes than the untreated glass.

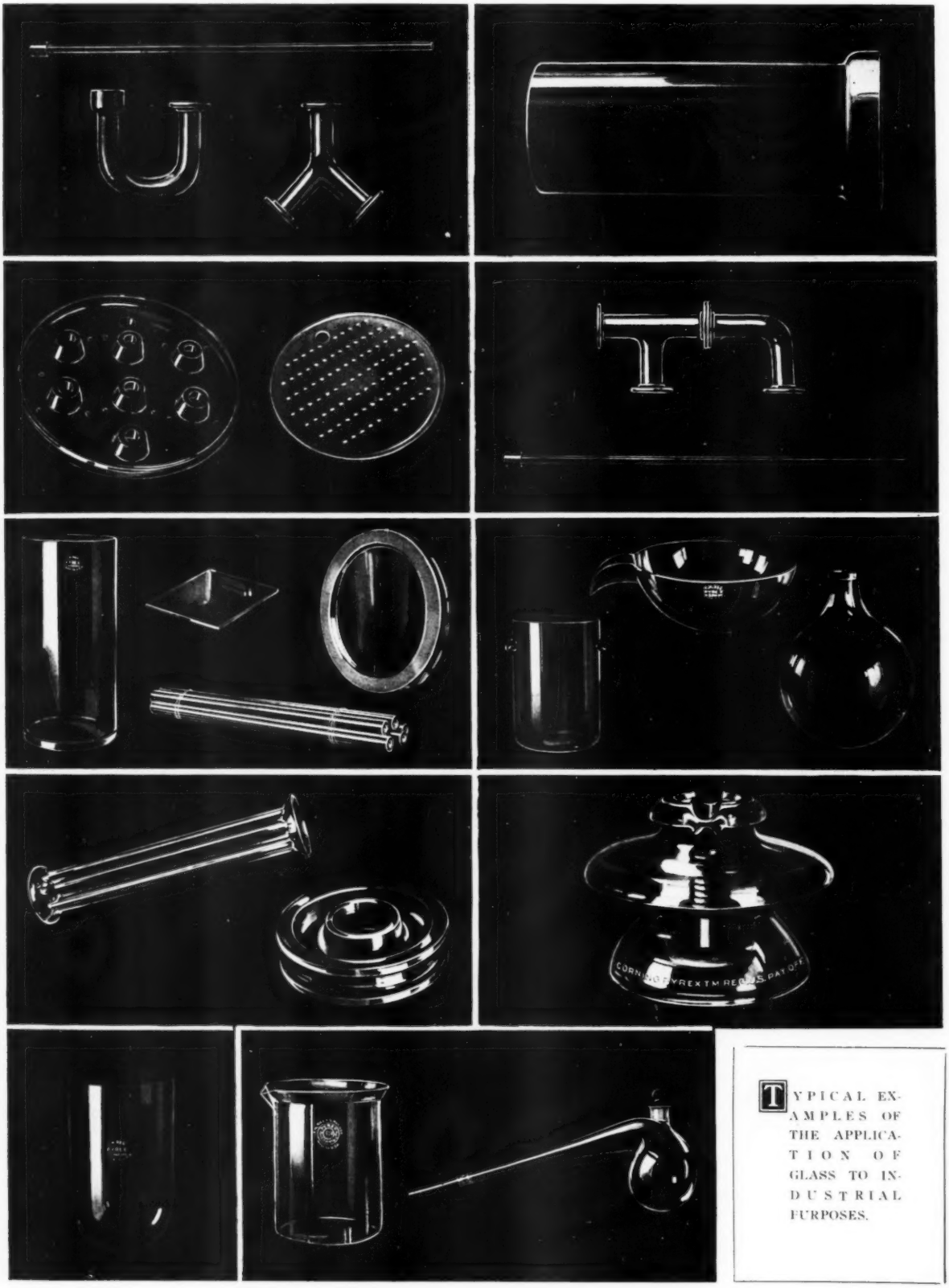
Time has, of course, modified the picture of possible uses for "hardened" glass, as painted by Siemens.

Modern steel-framed structures permit the inclusion of any desired window area in buildings, so the need for transparent or translucent bricks and wall tiles no longer exists. The proposed use of glass sleepers, or ties, on railroad tracks has an Alice in Wonderland flavor, and one would like to meet today the engineer who bravely tried out some Siemens glass ties in 1882. When we consider the suggestion of "hardened" glass tile linings for tanks, etc., the question arises as to whether there would be much improvement over the untreated glass then available. Tile linings, whether of glass or other material, are every-day objects in chemical engineering work, but the problem, when a lined tank has to be built, is not so much the selection of lining materials as cements.

The various types of pipe Siemens expected to make would have had uses if the liability to disintegration had been overcome, and if some simultaneous improvement could have been made in the thermal endurance.

The recital of Siemens' proposals makes it evident that his interest lay in physically changing one of the characteristics of ordinary glass, without modification of the glass batch composition. With our present knowledge of glass chemistry we realize that real improvements can more readily be brought about in the various properties of glass by development of new formulæ than by any system of treatment after the glass has been melted and shaped.

[3] Tenth Census of the U. S. Glass Manufacture, p. 1092 (1883).



TYPICAL EXAMPLES OF THE APPLICATION OF GLASS TO INDUSTRIAL PURPOSES.

A consideration of the present position of glass as an industrial material reveals little alteration in what might be called the architectural field, and a greatly increased usage in the manufacture of chemical and allied products, and in the construction of electrical apparatus.

These developments are due to the introduction of new types of glass with new combinations of properties which are so different from ordinary glass that from the engineering standpoint they are now considered as special materials.

Glass, because of its insolubility in acids, was always a favored material for laboratory and small-scale experimental work, but limitations in the way of temperature resistance restricted any large-scale use as the larger sizes of equipment had to be made with substantial walls, thus losing the thermal endurance of small shapes which always had thin walls.

With the development of Pyrex[4] baking ware, with its substantial walls, its demonstration of ruggedness under constant handling, and its resistance to heat shock, it became evident that some of the disadvantages of ordinary glass had been overcome, and that a new and promising material for laboratory and plant use had arrived.

This new glass had a surprisingly low coefficient of expansion, so when the production of laboratory apparatus was undertaken, baking ware practice was followed and the various shapes were made with thicker walls than had been customary with other glasses. The resulting improvement in resistance to mechanical shock and the increased resistance to temperature changes soon evidenced themselves by decreased service breakages.

Plant engineers became familiar with the advantages of the laboratory ware, and began to consider the desirability of trying to overcome some of their corrosion problems by the use of Pyrex plant equipment. The fabrication of the shapes needed for plant work called for many new methods of manufacture, so the history of the development of what is now called Pyrex industrial ware is a composite of definite improvements in glass properties and the working out of new processes of fabrication.

Before proceeding to describe the present varied industrial uses it seems desirable to detail the chemical and physical properties of the glass.

Mention has already been made of the expansion coefficient, and it is interesting to compare the expansion figures with those of other materials in frequent use:

LINEAR EXPANSION COEFFICIENTS
(Per ° C.)

Pyrex industrial ware	0.0000032
Porcelain	0.0000036
Hard glass	0.0000077
Soft glass	0.0000085
Cast iron	0.0000102
Wrought iron	0.0000119
Portland cement	0.0000120
Copper	0.0000167
Brass (66 Cu : 34 Zn)	0.0000190
Zinc	0.0000258
Lead	0.0000276

Mineral acids, with the exception of hydrofluoric and phosphoric, have no appreciable action up to their respective boiling points. Initially, there is a very slight surface attack, the figure for constant-boiling hydrochloric acid being 0.000006 g., and for fuming sulphuric acid 0.000002 g. per sq. cm. per hour at boiling point. This initial action is succeeded by a state of practical stability.

In the case of phosphoric acid the attack produces crystallization of the glass surface and makes accurate determinations of solubility rather difficult. An average figure arrived at by the Laboratories of Corning Glass Works is 0.0027 g. per sq. cm. per min. Hydrofluoric acid does not attack Pyrex ware as readily as other glassware, this being a matter of knowledge possessed by all laboratory workers who have tried to etch beakers or flasks. The action is, however, sufficient to prevent any serious consideration of the use of Pyrex equipment for hydrofluoric acid or fluoride production.

Caustic alkalis show, as might be expected, increased action with increase of concentration and temperature. For caustic soda, with 6 hours' boiling, the following average values have been obtained in the Corning Laboratories: 0.1 *N*-solution, 0.0005 g. per sq. cm. loss; 0.5 *N*, 0.0012 g.; 5 per cent, 0.0022 g.; 35 per cent solution, 0.0032 g. per sq. cm. loss.

Some of the other properties of interest to the chemical engineer and the physicist are: specific gravity, 2.25; specific heat, 0.20; elasticity coefficient 6230 kg. per sq. mm.; refractive index, 1.4754; dispersion, 0.00738; light transmission, higher than plate glass: hardness, 120 (scleroscope).

Heat transfer is, of course, a vital factor in many forms of plant equipment. The Corning Laboratories have devoted a good deal of attention to measurements of the rate of heat transfer, and it has been found that while copper has a thermal conductivity 300 times as great, it only condenses 2.5 times as much as the glass at rates of flow customary in plant practice. Under actual plant operating conditions value as high as 125 B.Th.U. per sq. ft. per hr. per deg. F. have been obtained in Pyrex tubular horizontal coolers designed for liquid-to-liquid heat transfer.

Uses for a material possessing the unusual combined properties of transparency, chemical stability, low expansion, and a high degree of surface smoothness and hardness are varied, and an analysis of specific applications shows that while one property may be of primary importance, some or all of the other qualities are usually also of direct benefit.

Where resistance to corrosion is an outstanding requirement, thermal endurance and surface smoothness are generally advantageous characteristics in constructional materials. Most chemical operations involve the application and withdrawal of heat, so that equipment resistant to corrosion, but incapable of withstanding temperature changes, would be of value only for reactions in the cold, or for storage purposes. Heat transfer values are decreased to an appreciable extent by rough surfaces, so that smooth surfaces permit heat transfer apparatus to remain reasonable in size even when materials of low conductivity are used in their construction.

J. T. Littleton and H. C. Bates,[5] in their determinations of the heat-transfer value of Pyrex condenser tubes, made

[4] Trade Mark Reg. U. S. Pat. Off.

[5] Trans. Amer. Inst. Chem. Eng., 1925, 17, 95.

parallel runs on copper and steel tubes. They found that the thin oxide film developed by heating copper tubes in air at 550° for 1 hr. decreased the rate of transfer 12 per cent as compared with the tube before oxidation.

In other applications smoothness may be the most important property, and transparency or chemical stability the qualities called on to make the smooth surfaced article a practicable piece of equipment.

It is, of course, impossible in this paper to detail all the current uses of Pyrex equipment in the chemical industries, so after outlining the size limitations of the present fabricating processes a few typical applications will be described.

Pyrex equipment is made by the glass working processes of drawing, blowing and molding.

Tubes are made by drawing a hollow "gather" to the desired diameter by manual or mechanical means. For industrial purposes, particularly coolers and heaters, tubes are employed up to 18 ft. long and 3 in. diameter. The limitation of length for single pieces is represented by the requirement of safe shipment rather than manufacture.

Blowing methods involve gathering a suitable mass of material on a hollow pipe, introducing the "gather" into a mold, and expanding by air pressure. The weight of glass which can be gathered manually limits the present size of blown articles to about 20 gals. capacity but it is expected that mechanical methods, which are now being developed, will enable a very considerable increase to be made in the capacity of blown shapes.

Pressing calls for either manual gathering or mechanical flowing, and delivery, of a definite amount of molten material into a mold where the final shape is secured by controled pressure on a plunger. Press molding is employed for both small and large shapes, some pressed pieces weighing 1 oz. whilst items like tower plates may be over 20 lbs.

Sometimes the operations of pressing and blowing are combined, as for instance shapes where the inside diameter of the neck portion has to be made to closer limits than are obtainable by the blowing process alone.

Use is also made of flame shaping and welding, examples being flanged pipes produced by welding a pressed flange to a drawn tube, and one-piece coils made by welding together the necessary number of coiled pieces shaped in the flame.

When Pyrex equipment was still new and therefore relatively untried, uses centered around tubes and piping. The reason may have been that glass tubes were familiar things and like the prolonged use of glass for its transparency alone, the tubing and piping applications were obvious.

Pyrex tubes and pipes are used extensively for the conveyance of hot acid liquids and gases, for the construction of heat exchangers, particularly where corrosive conditions exist, and in equipment where the purity of the product is important. Various types of flanged, socket, and sleeve joints are employed dependent on the nature of the use.

C. M. Hoff[6] has recently described the application of Pyrex condenser tubes and manifolds to the production of C. P. hydrochloric acid. This is a typical use of the material as a means of securing a pure product.

[6] Chem. Met. Eng., 1928, 35, 419.

While at the present time Pyrex piping is an important outlet for the material, there are many other Pyrex products which have proved their worth to the chemical industry.

Pressed perforated plates for reaction towers or column stills and bubbler caps for absorption columns are examples of uses which depart from the former accepted limitations of glass as an industrial material. Resistance to corrosion is a requisite for such service, and as tower plates are made up to 24 in. diameter, thermal endurance is essential.

Another group of uses is based primarily on transparency with additional needs of chemical stability and resistance to temperature changes. These comprise sight glasses for stills, reaction kettles, and furnaces, sight pipe sections for observing flows in metal pipe lines, gauge glasses, and sheet for refinery look boxes.

Surface hardness and temperature resistance are the underlying reasons for the use of Pyrex parts on rayon spinning machines, Pyrex pulleys and guides on wire and chain plating mechanisms, and, one of the latest interesting developments, Pyrex bearings for light loads.

Smoothness of surface and chemical resistance have made Pyrex reels for skein silk dyeing machines a very practical application, and the same characteristics plus thermal endurance are responsible for the use of the material as a liner for coffee urns.

Another property not previously mentioned, the low alkali content, has been the foundation of new and interesting applications in the storage and distribution of pharmaceutical and serological products.

The maximum available sizes have obviously created some limitations to employment in chemical plant, but even without size increase, which will be one of the next developments, it is obvious that an interesting material with some unique characteristics has been placed in the hands of the chemical engineer. The engineer, as the previous outline shows, has already applied the material to a variety of uses, and in so doing has improved the durability and reliability of many forms of plant equipment.

The successful development of plant apparatus, based on improved chemical and physical characteristics, suggested the desirability of extending the study of possible applications of the material to insulation for electrical purposes.

Measurements made at Corning, and checked by various electrical laboratories, had proven the electrical quality of the glassware sold under the Pyrex trade-mark to be greatly superior to those of ordinary glass, and better than the best grades of porcelain. Combined with the other properties these measurements indicated that Pyrex insulators would be ideal for power line work, and in the last few years this use has progressed from the experimental stage to today, when over 250,000 insulators are in service on transmission lines.

The insulators are made in one-piece designs, and are free of cement even in the large types. This is practicable because of the low thermal expansion coefficient of the glass and its thermal transparency to solar radiation. Pyrex insulators do not heat in sunlight. Consequently they can be made in large heavy sections. Experiments made in sunlight show the relative rise of temperature of Pyrex insulators is about

one-seventh that of black, absorbing bodies such as porcelain.

These insulators have been found to resist power arcs and puncture to a remarkable extent; 2000 amperes for 2 seconds will not put them out of commission, and they have withstood without failure 1,500,000 volts on impulse tests.

The shapes are such that the insulator surfaces tend to remain clean in service, but under severe conditions where dirt is accumulated as is often the case around electrochemical plants, the design is such that the insulators can be readily washed, and after washing the properties will not be changed since there is no glaze to wear off.

A still more recent development has been the application of Pyrex insulators to radio work. Service requirements for radio insulation are particularly severe, as the high-frequency currents tend to leak over and through imperfect insulation destroy the efficiency of transmission. Even in the case of reception, where the incoming impulses are extremely weak, insulation is a factor if maximum signal volume is to be obtained.

The electrical characteristics of Pyrex radio insulators are quite interesting, and the appended data will enable useful comparisons to be made by those familiar with the corresponding measurements for ordinary glass, porcelain, and synthetic insulating products: dielectric strength, 35 kv. per 100 mil thickness; dielectric constant, 4.48 (50,000 cycles); phase angle difference, 0.16 per cent (30,000 cycles); power factor, 0.28 per cent (30,000 cycles).

Pyrex radio insulators are recognized as essential equipment where conditions demand continuous dependable communication.

As examples the various Arctic and Antarctic expeditions of the last three years have used this insulation, and the message Commander Byrd sent from his plane when he crossed the North Pole went from an antenna equipped with Pyrex insulators. On his present Antarctic voyage Commander Byrd has centered his plans on constant radio communication between ship, base, planes, depots, and sled parties, and because of the previous successful use, Pyrex insulators will again play their part in establishing and maintaining that vital phase of modern exploration—communication.

In concluding this review of the new properties and new uses of a material which with a fixed and limited set of properties, had been known and manufactured for 6000 years, there comes to mind a paragraph in Haldane's book "Possible Worlds":

"The reality of a flower (to a bee) would be the sucking of honey or the gathering of pollen, rather than the flower's form, color or odor. It is only because for us most things may have more purposes than one that we do not think of them this way."

The story of these new glasses is but one of many which could be written on old materials with new properties, and most of them would belong to our present century.

PATENTS LAW AND PRACTICE. *By Oscar Geier. Fourth Edition. Published by Richards & Geier, Patent and Trade-mark attorneys, 274 Madison Avenue, New York. 9 x 6 inches, 46 pages. Sent gratis to legitimately interested persons.*

This volume gives information as to how domestic and foreign patents and trade-marks are obtained.

Production of Feldspar in 1928

The crude feldspar sold or used by producers in the United States in 1928 amounted to about 210,811 long tons, valued at $1,418,975, or $6.73 a ton, according to reports obtained directly from producers by the United States Bureau of Mines, Department of Commerce, in co-operation with the Geological Surveys of Maryland, New York, North Carolina and Virginia. These figures show an increase of 4 per cent in quantity, but a slight decrease—.4 of 1 per cent—in total value compared with 1927. Feldspar was mined and sold in 1928 in 12 States, namely, Arizona, California, Colorado, Connecticut, Maine, Maryland, New Hampshire, New York, North Carolina, Pennsylvania, South Dakota and Virginia. The greatest feldspar-producing region is that which includes the Atlantic Seaboard States, from Maine to North Carolina. This region reported about 90 per cent of the total production and value in 1928. North Carolina, the leading state, reported about 50 per cent of the total output; New Hampshire, the second state, reported 14 per cent; and Maine, the third state, 12 per cent. The average value per long ton in North Carolina was $5.97; in New Hampshire, $7.79, and in Maine, $8.07.

Except for minor purposes, feldspar is prepared for use by grinding. This work is done principally by commercial mills; only a very small portion is ground by users in their own mills. In 1928 there were 31 commercial mills operated in 12 states, namely, California, Colorado, Connecticut, Illinois, Maine, Maryland, New Hampshire, New Jersey, New York, North Carolina, Ohio and Tennessee. These mills reported 227,667 short tons of ground feldspar sold in 1928, valued at $3,459,028, or $15.19 a ton, compared with 223,915 tons, valued at $3,564,141, or $15.92 a ton, in 1927, an increase of less than 2 per cent in quantity but a decrease of 3 per cent in value. Of the quality sold in 1928, 202,844 short tons, valued at $2,951,281, or $14.55 a ton, was domestic feldspar, and 24,813 tons, valued at $507,747, or $20.46 a ton, was imported feldspar, including Cornwall stone. Imported feldspar was ground in three states in 1928—New Jersey, New York and Ohio. These figures represent a decrease in imported feldspar as compared with 1927.

The production of crude feldspar by states in 1927 and 1928 is shown in the following table:

CRUDE FELDSPAR SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1927 AND 1928.

	1927		1928	
State	Long tons	Value [a]	Long tons	Value [a]
Arizona	(b)	(b)	(b)	(b)
California	5,260	$43,329	11,891	$81,199
Colorado	(b)	(b)	(b)	(b)
Connecticut	6,123	43,319	6,292	48,996
Maine	34,328	299,386	25,063	202,219
Maryland	2,001	11,612	2,349	10,325
New Hampshire	27,449	223,077	30,343	236,224
New York	12,020	96,446	13,971	120,559
North Carolina	100,756	612,214	105,560	630,042
Pennsylvania	3,938	24,257	2,052	8,851
South Dakota	(b)	(b)	(b)	(b)
Virginia	(b)	(b)	(b)	(b)
Undistributed	10,622	71,115	13,290	80,560
	202,497	1,424,755	210,811	1,418,975

(a) Value at mine or nearest shipping point.
(b) Included under "Undistributed."

Glass Industry

ESTABLISHED 1920

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Support Your Trade Association

In the present days of gigantic mergers, taking place in many lines of business, the individual enterprise appears to be becoming of diminishing importance. It is being predicted that in not so many years most people will be in the employ of corporations, which in turn are controlled by majority stock interests held by large financial institutions. Unfavorable contrasts are pointed out with conditions that existed in the past making for individual effort, and that have been largely responsible for developing the sturdy qualities of earlier generations.

However this may be regarding other industries, it cannot be said that individualism in the American glass industry is being seriously threatened. We believe that the small glass factory is in no particular danger of being obliterated. This refers especially to the small manufacturer of table glassware, art glass and glass specialties. These lines call for flexibility of manufacturing conditions to meet the ever changing demands of taste and fashion. They require small units which can be housed in factories of simple construction, that do not require a large outlay of capital. The product can in many cases be decorated, and its value thus enhanced many times.

There are certain problems, however, that the individual manufacturer cannot hope to meet alone. What aids these smaller units in their struggle for life more than anything else is the fact that they have organized themselves, to form trade associations. These can handle advertising on a national scale to create a demand for the products of their members. They can take care of traffic problems, standardization and research on a scale that would be impossible to attempt, to the individual manufacturer.

The support of the trade association of any particular group of glass manufacturers is not simply "a good policy." It may mean the very life of the industry. No better investment can be made by the small as well as the large glass manufacturer than the support of a live trade association.

Correspondence

To the Editor of THE GLASS INDUSTRY:

After reading the article by Gehlhoff and Thomas in your April number I made a memorandum to write you of our appreciation of your compliance with our suggestion that this translation be published. Your letter of May 8 beat me to it. I have not yet had an opportunity to read the May number, but will of course do so at the first opportunity.

Concerning your comment about articles of this character being too scientific for many of your readers, you are of course acquainted with the characteristics of your reading public, but it seems to me that there must now be a large number of technically trained men in the industry who are exceedingly glad to get hold of translations of scientific articles which are more or less directly applicable to factory work. As compared with the profound scientific discussions on the constitution of glass, such papers as that of Gehlhoff and Thomas are very light reading. But the main point is that there are a great many of us who might be classed as "laymen scientists" who are glad to get translations of useful articles published in other languages, because it is hardly feasible for us to translate them ourselves.

PENNSYLVANIA WIRE GLASS COMPANY,
Dunbar, Pa., May 13, 1929. (Signed), L. T. SHERWOOD.

Foreign Trade of the German Glass Industry

—and what is behind it

By G. HIRSCHFELD
(For This Journal)

IT is characteristic of the German Glass Industry that it is one of the few within Germany which uses exclusively domestic raw materials. This is the reason why the export surplus of this particular industry reaches a relatively high amount, namely between 150 and 200 million marks or about 40 to 50 million dollars. A further characteristic of the German glass production is the fact that during the last years many factories have been equipped with machines, where manual labor was the rule before.

In this connection it is well to remember that after the war Germany borrowed from foreign countries, and particularly from the United States, an amount of between 12 and 13 million marks, part of which has been used for payments on account of the reparation debt, while another part has been invested into the various industrial enterprises of Germany, thus enabling the producers to improve the equipment and to bring their factories as a whole up to a higher degree of capacity and efficiency. The glass industry has profitted to a certain degree through these investments and as the result we find quite a number of factories mechanized and modernized according to up to date production standards.

To what extent the machinery in the glass works was increased can be seen in the fact that the machine-equipped glass works are united in the "Association of the German Plate Glass Works," whereas the old plants have not been admitted to membership. The strongest competition of the German plate glass industry is concentrated in Belgium and Czechoslovakia. Although the cost of manufacturing could be greatly reduced on account of the rationalized system and on account of the mechanization of the plants, yet the cost basis of these two competing industries has not been reached. If the German cost price is still above that of the Czechoslovakian and Belgian manufacturer, this is largely due to the fact that the latter countries have the advantage of lower wages. So it happens that the German glass industry finds itself in the same position as regards its two neighbored competitors as the United States in practically all of the industrial branches towards Europe.

Another handicap, which accounts to a certain degree for the recently shown decline in the German export trade of the glass industry lies in the upbuilding of national glass industries in such markets, where formerly the demand was largely covered by imports from Europe. The United States is probably the best example to prove, what a powerful industry can be built up in a relatively short time. It seems true to say that in all these years the German export trade has lost more business in the United States than in any other market of the world. The Far East, however, is another market, where a national glass industry, not founded so long ago, has taken a considerable proportion of the import business into its own hands.

It is for these reasons that the German glass industry is looking for other markets and this is the more true, as the consumption capacity within Germany is at a very low level since the end of the war. There is another factor, which emphasizes the urgent need for an increased export trade; the heavy financial burden laid upon the German people through the loss of the war and the therefrom resulting Treaty of Versailles and the Dawes Plan, put German commerce and industry into a position, where these heavy taxes and debts can only be paid out of an export surplus. True the export surplus of the German glass industry is particularly large, as has been mentioned above, but it is not large enough to cover the tremendous demands upon the resources of each one of these manufacturers. Consequently, every one of the German glass manufacturers is trying to solve the problem of how his export business can be increased.

The market, which, no doubt, offers the best prospects for larger shipments of glass from Germany is South America. The German factories are well represented in this tremendous territory. Their agents speak the native language, i. e. Spanish, and are in most cases in close contact and in very friendly relations with the South American people. As far as the competition with the North American manufacturers is concerned, the German producers have the decided advantage of a lower price, at least in the majority of the cases, and besides they know how to deal with the peculiar conditions, which one who sells his goods to South America has constantly to face. In many cases it can also be found that the German manufacturers give longer terms than those which are allowed by the North American manufacturers. Another advantage, which favors the German exporter, consists in the fact that the latter is rather easily inclined to accept specifications, which go beyond the standardized limits, whereas his North American competitor is apt to refuse an order because it is not based on standard sizes.

Eastern Europe offers also splendid possibilities for the development of the export trade of the German glass industry. Countries like Russia, Poland, Lithuania, Latvia, Estonia, etc., are hardly developed and while the present demand from these markets is proceeding at a quite satisfactory rate, it may be safely assumed that this demand will be multiplied many times in 10 or 15 years.

When we try to summarize the condition and the trend of development of the German glass industry, it might be said that in spite of tremendous difficulties of an economic and particularly financial nature, this industry has mastered the after-war depression and that it is now going on to build up its export trade in a very energetic and decisive manner.

Industrial Publications

Health Practices Pamphlet No. 3. Lead. National Safety Council, Chicago. A compilation of facts concerning lead poisoning and the industries in which it occurs, including glass cutting and polishing. The manner in which lead compounds are formed that are detrimental to the workers' health and the effect on the system is described; the symptoms of lead poisoning are listed, the diagnosis of lead poisoning is outlined, the clinical manifestations are described including those of the blood, gastro-intestinal tract, nervous system, skeletal system, the cardio-vascular and the urinary and reproductive systems.

The distinction between lead absorption and lead poisoning is explained. Rules for the prevention of lead poisoning are given. Instructions to employes and the treatment of lead poisoning is briefly outlined. Copies of this 8-page pamphlet containing also other valuable information may be obtained by manufacturers free of cost from T. A. Burke, Director of Publicity, National Safety Council, 108 E. Ohio Street, Chicago, Ill.

Best Safety Placard

In the opinion of F. W. Hobson superintendent of the Carter Oil Company, the best placard he ever used to keep Old Man Accident off his payroll was just this:

EYES THAT SEE
AND
BRAINS THAT THINK
ARE
THE BEST SAFETY DEVICES KNOWN
USE THEM

From *National Petroleum News.*

Dynamite

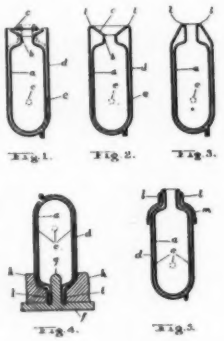
Some people consider research a dull and sleepy affair. To me, research is full of dynamite. In the hands of a competitor it can strew your own business path with heartbreaking obstacles. Used by yourself, it can blast your way to success. If you are not using the research method to find new and better ways of manufacturing and selling your products, if you are not experimenting to find new products which you can profitably handle, now or in the future, your competitor is doing so, make no mistake about that.—A. LINCOLN FILENE in *Business Chemistry.*

Recent Patents

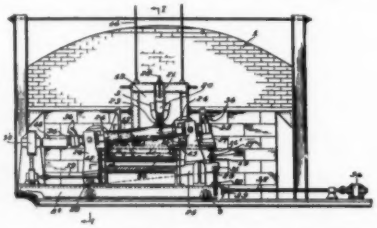
NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

MANUFACTURE OF DOUBLE-WALLED GLASS VESSELS. U. S. 1,674,182. June 19, 1928. Fritz Siegheim, Berlin, Germany. Filed 9/15/26 and in Germany 8/30/28. The method of placing the inner and outer shells one within the other and then melting together at the upper rim, is costly, necessitating repeated heating, working and annealing, and a considerable number are wasted by breaking in manufacture. The present invention seeks to overcome all the above mentioned difficulties. The new method of forming a double-walled glass vacuum flask includes inserting a glass vessel having a short neck and a flaring or funnel-shaped flange at the outer end thereof, within a second substantially cylindrical glass vessel, melting together the free edges of the wall of said outer vessel and said flange, and thereafter contracting the melted together parts, whereby a neck is formed on the outer vessel, the flaring flange of the inner vessel becomes a cylindrical extension of the neck of the latter and outer edge is turned outwardly and downwardly to cause the joint between the inner and outer vessels to be disposed on the outside of the neck of the finished flask and substantially below the rim, where it is better protected when encased in a holder, from shocks.



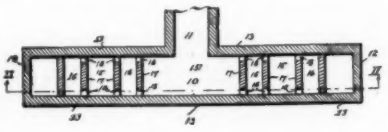
APPARATUS FOR MAKING PLATE GLASS. U. S. 1,716,312. June 4, 1929. Chester E. Henderson, Kokomo, Ind., assignor to Pittsburgh Plate Glass Company. Filed 2/20/28. The combination with a glass melting tank having an outlet, of a pair of driven sizing rolls arranged to receive between them adjacent their ends the flow from said outlet, and inclined downward toward their other ends, and a runway for receiving the sheet formed in the pass between the rolls, and said outlet having a width which is only a fraction of the width of the sheet produced and positioned to discharge at the upper ends of the rolls so that the mass of glass thus supplied between the rolls flows down the inclined recess to provide a mass corresponding approximately in length to the width of the finished sheet.



PROCESS FOR THE MANUFACTURE OF TRANSLUCENT HOLLOW-GLASS ARTICLES, PARTICULARLY OF MILK-GLASS BULBS FOR ELECTRIC INCANDESCENT LAMPS. U. S. 1,713,394. May 14, 1929. Marcello Pirani, Berlin-Wilmersdorf, Germany, assignor to Patent-Treuhand-Gesellschaft Fuer Elektrische Gluehlampen. Filed 3/24/27. Method of making translucent hollow glass bodies, which comprises finely grinding glass, adding thereto a clouding material, sintering the mass, and blowing a gob thereof while being heated to blowing temperature, while maintaining uniform distribution of the small air or gas inclusions that produce translucency.

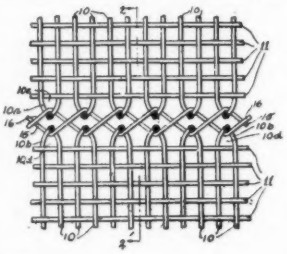
BUBBLE OR BLISTER GLASS. U. S. 1,715,130. May 28, 1929. Reuben Haley, Beaver, Pa. Filed 10/7/27. The method of making blown glassware, which consists in gathering a core of molten glass on a blowpipe, in depositing upon such core while still molten finely divided bubble forming material, incasing the core and bubble forming materials with molten glass and then in blowing the combined gathers to form the article.

GLASS FURNACE. U. S. 1,715,568. June 4, 1929. Jules J. Quertinmont, Point Marion, Pa. Filed 4/4/28. A glass furnace for drawing continuous sheets of glass, comprising a drawing tank having a bottom, longitudinal and end walls and divided into a series of alternating drawing and reheating chambers, transverse partition walls resting on said bottom and separating said drawing and reheating chambers and provided with opening adjacent to said longitudinal walls to permit the body of molten glass in contact with and in proximity to said longitudinal walls to flow through said openings from said reheating chambers into the drawing chambers during the drawing of the sheets of glass.

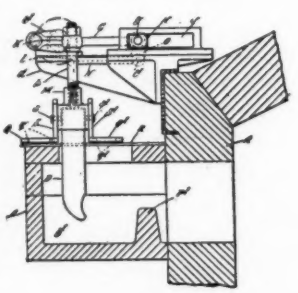


LAMP-MAKING MACHINE. U. S. 1,707,675. Apr. 2, 1929. Walther-Winfried Loebe, Waidmannslust-Berlin, and Willy Ledig, Berlin, Germany, assignors to General Electric Co. Filed 1/24/27. One object is to provide a transportation device which will not only automatically feed the incandescent lamp parts to the operators at the intermediate working positions, but at the same time make it very convenient for them to take off and deposit lamp parts.

SEAM FOR WOVEN-WIRE BELTS AND METHOD OF MAKING IT. U. S. 1,716,860. June 14, 1929. Hamilton Lindsay, Cleveland, O., assignor to Lindsay Wire Weaving Company. Filed 9/4/28. A woven wire belt having warp wires and weft wires, the warp wires being joined together in groups independently of the weft wires to form loops at each end of the belt, and means extending through the loops and across the seam opening for connecting the ends of the belt.



GLASS FURNACE. U. S. 1,716,456. June 14, 1929. Thomas Courtney Moorshead, Strand London, England, assignor to the United Glass Bottle Manufacturers, Ltd. Filed 6/11/28. A glass furnace for use with bottle forming machines of the suction type comprising a forehearth, a dam positioned in the vicinity of the point where the bottle forming machine sucks its charge, a second dam positioned in front of the furnace and glass circulating means positioned between the said dams, the first mentioned dam also being adjacent the glass circulating means.



REENFORCED GLASS SUBSTITUTE. U. S. 1,713,198. May 14, 1929. Leroy E. Spence and Joseph R. Hogate, Bladen, Neb. Filed 10/4/26. A glass substitute for transmitting ultra-violet rays comprising a woven fabric base having reenforcing textile strands extending through said fabric base in spaced relation and of heavier material than the other strands of the fabric base and a translucent material carried by said fabric base and reenforcing textile strands, said strands being in spaced crossed relation thereby forming zones between the reenforcing textile strands and a translucent material carried by said fabric base and reenforcing textile strands.

The Glass World and What It Is Doing

News of the Industry

Findings of Special Masters in Glass Feeder Patent Cases

Detailed and lengthy reports were filed on May 28 of the findings of Berne Jones, Special Master to Judge Benson W. Hough of the United States District Court in the Southern District of Ohio, Eastern Division, in two cases of patent infringement alleged by the plaintiff Hartford-Empire Company against Lamb Glass Company, defendant, in one case, and the Kearns-Gorsuch Bottle Company, defendant, in the other case.

In the Lamb Glass Company case the patents in question were the Steimer, No. 1,564,909; Peiler, No. 1,573,742; Soubier, No. 1,574,709; Ferngren, No. 1,574,739; and Peiler, No. 1,631,107.

The history of these patents and of some of the litigation in which they have been involved is given in the report in some detail. The automatic glass feeding device in use by the defendant is described. The Steimer patent noted above was discussed and the opinion expressed that it is inoperative and without utility and that as issued it is not the invention of Theodore C. Steimer.

"Boiled down," the report says, "and stripped of all technical phrases the contentions of the plaintiff and defendant are as follows: The plaintiff contends that the patent finally issued is based on disclosures originally contained in the first application of Theodore C. Steimer, filed February 12th, 1910, and covers broadly the feeding device containing the pulsating, reciprocating plunger, possibility of adjustment during operation so as to control the size and weight of several mold charges in suspension, while the defendant claims that the original application of Theodore C. Steimer discloses merely a feeding device in which the plunger was intended to act as an interrupter or stopper which would rise to allow the proper amount of glass to flow or issue from the outlet in the bottom of the bowl and then fall so as to seat in the outlet, stop the flow or issuing of the glass and divide the same, assisted by the jets of flame, into mold charges of the required size and weight.

"Both the contention of plaintiff and defendant depend upon the interpretation of the use of the screw, regulating the limit of the lower movement of plunger or interrupter, the plaintiff contending that such limiting makes of it a non-seating, reciprocating plunger, while the defendant contends that such limiting means was only for the purpose of preventing a too violent seating of the plunger."

The Peiler, Soubier, Fergren patents were also thoroughly discussed. The report is concluded as follows:

"We find the plaintiff is not estopped from bringing this suit by reason of any agreements or contracts entered into with William J. Miller or Miller Glass Engineering Company; that the Steimer patent in Suit No. 1,564,909 is only valid as limited to the particular apparatus described and that the claims of this patent so interpreted are not infringed by the defendant; that claims Nos. 1 to 10 inclusive of the Peiler Phase Changing Patent No. 1,573,742 are functional and therefore invalid but that claims Nos. 18, 26, 27, 28, 34, 36 and 37 of said patent, reading on plaintiff's single-needle feeder apparatus, are valid and infringed by the defendant's feeders and that said patent, so far as the single-needle feeder is concerned, is entitled to the date of the original application therefor, to wit May 5th, 1919; that claims Nos. 14, 15, 16 and 24 to 30 inclusive of the Soubier Patent No. 1,574,709 are valid and infringed by defendant's device; that claims Nos. 1, 7 and 13 of the Ferngren Patent No. 1,574,739 are not infringed by defendant's device; and that Peiler Whittling patent No. 1,631,107 is invalid being purely functional as to its claims.

"We recommend that a decree be entered in accordance with the above findings and conclusions, and judgment be entered in accordance therewith, and that the cost of this proceedings be taxed as the court may deem proper."

In the case of the Hartford-Empire Company vs. Kearns-Gorsuch Bottle Company the patents involved are: Steimer, No. 1,564,909; Peiler, No. 1,573,742; Peiler, No. 1,589,304; Peiler, No. 1,631,107. At the conclusion of his report on this case the Special Master said:

"We have carefully considered all of the issues joined in this cause, the testimony and exhibits, briefs and arguments of counsel and the authorities cited, whether herein discussed or not and find that the defendant is not estopped from questioning the validity of the patents in suit by reason of license contracts entered into with the plaintiff; that the Steimer patent in suit No. 1,564,909 is only valid as limited to the particular apparatus described and that the claims of this patent so interpreted are not infringed by the defendant; that claims Nos. 1 to 10 inclusive of the Peiler Phase Changing Patent No. 1,573,742 are functional and therefore invalid, but that claims Nos. 18, 26, 27, 28, 34, 36 and 37 of said patent, reading on plaintiff's single-needle feeder apparatus, are valid and infringed by the defendant's feeders and that said patent, so far as the single-needle feeder is concerned, is entitled to the date of the original application therefor, to-wit, May 5th, 1919; that the Peiler Shear Height patent No. 1,589,304 is valid only, if at all, as limited to the particular mechanism employed and that so limited it is not infringed by the defendant's device; and that Peiler Whittling patent No. 1,631,107 is invalid being purely functional as to its claims.

"We recommend that a decree be entered in accordance with the above findings and conclusions, and judgment be entered in accordance therewith, and that the costs of this proceedings be taxed as the court may deem proper."

Toledo Glass Concerns Win Big Patent Suit

The suit of the Europaischer Verband der Fashen Fabriken, otherwise known as the European Association of Glass Bottle Manufacturers, against the Owens Bottle Company, Toledo Glass Company, Libbey-Owens Sheet Glass Company, Owens European Bottle Company, E. D. Libbey, Michael J. Owens and other officers in the defendant companies and filed in the Federal Court at Toledo, Ohio in 1926, was dismissed and the companies completely exonerated in a decision announced on June 17 by Judge George R. Hahn. Since the suit was filed the deaths of Mr. Libbey and Mr. Owens, pioneers and leaders in the development of glassmaking and glass blowing machines, have occurred.

The plaintiff sought damages involving many millions of dollars, charging breach of contract. An attempt was made to make Mr. Libbey and Mr. Owens as individuals, responsible for the alleged breach of contract by the defendant companies. The defendants claimed that the German company had failed to carry out the terms of a contract made with the American company in 1907.

The Verband claimed the right to use the Graham automatic bottle blowing machines; improvements to Owens Automatic bottle machines, as well as Libbey-Owens sheet glass drawing machines, all processes of which are recognized as leading in the art. The Verband claimed the right to use these in Europe and South America. The claim was not made for the American rights but was confined to foreign rights. The German claim has now been denied and the American companies, by the decision, are free to continue exploitation of their foreign business.

The decision has created not only nation-wide interest but the attention of European because of the dominating position of the Owens-Illinois Glass Company, which is a recent merger of the Owens Bottle Company and the Illinois Glass Company.

The suit was one of the most stubbornly contested in the history of the court. The case was tried first before Judge Westenhaver last year. He died before making a decision. The suit came before Federal Judge Hahn some weeks ago, taking 17 days, seven of which were devoted to oral arguments by attorneys from Toledo, Cleveland, New York, Cincinnati, London and Berlin.

In dismissing the bill of complaint against each of the de-

fendants and placing the cost of the suit upon the plaintiff, Judge Hahn states in his decision:

"It is most unfortunate that the Messrs. Libbey and Owens did not live to themselves testify in this action. The record, however, shows that they performed their duties as officers and directors, hence as trustees of the various corporations involved, in a careful and conservative manner and that they were not only frank and fair but generous to the plaintiff and its predecessors. Their acts and conduct do not require the vindication of any court."

It was charged in the bill of complaint that the German company in 1907 had made an agreement with the American companies for the exclusive use in Germany of American patented glassmaking machines controlled by the American companies, and the German company by the terms of the agreement was to have exclusive rights to the patents in Germany and certain other stipulated territories. All new patents and improvements in glassmaking machinery obtained in future by the American companies were to be included, it was asserted.

The plaintiff said the defendant companies had abrogated the agreement made in 1907 and had failed to comply with their part of the contract. In defense the American companies declared the German company had failed to keep certain clauses in the contract, including that relating to the expansion of trade territory and the development of new markets within the area provided in the contract.

The German company said this was not true until the advent of the World war when it was unable, because of the war, to comply with certain stipulations.

In another paragraph in his decision of more than 50 pages, Judge Hahn further states:

"It has been difficult to understand the attitude of the plaintiff. It has not hesitated to make claim for any invention, whether made or purchased, whether the party against whom the claim was made was a party to the contract or not, or whether it had been organized at the time that the contract was executed.

"It has claimed that it is entitled to the sheet glass patents which were purchased and which involved an industry wholly foreign to the purpose of the members of its association. It has gone to the length of claiming that Messrs. Libbey and Owens by their agreement personally guaranteed that all the corporations involved, and whose obligations have no limit as to time, would perform their obligations as the same are interpreted by the plaintiff.

"On the other hand, plaintiff alleges in its bill that it has fully performed its obligations and agreements. Among these is its solemn obligation to bind its licensees and their employees to give notice of their future inventions and improvements, an obligation which it has almost wholly disregarded to such an extent that the defendants plausibly claim that the plaintiff has no standing to appeal to a court of conscience for its peculiar and extraordinary remedies."

Busy Days for Tariff Subcommittee on Glass

On June 25 and 26 the subcommittee of the Senate took testimony from a great number of witnesses for and against changes in the proposed glassware tariff schedule now under consideration. Manufacturers and importers of nearly all kinds of glass and glassware were represented. Among those who presented their arguments were Thomas W. McCreary, W. L. Crounse, W. A. Leach of the Glass Container Association, James Maloney, C. B. Roe, Joseph Gilhooly, C. H. Schottland, William M. Bonesteel, A. G. Cramer, W. Hammer, H. Wechsler, H. N. Hott, H. A. Baum, Guy S. Felt, M. V. Wyvell, George L. Payne, Richard Blank, John Storck, Jr. Also Percy H. Jennings of Vitaglass Corporation, C. J. Gundlach of Mississippi Rolled Glas Company, A. Solomon, importer, and R. B. Tucker, representing several plate glass manufacturers.

New Name for Old Bottle Company

The Upland Flint Bottle Company, Marion, Ind., has changed its name to the Foster-Forbes Glass Company. There has been no change in ownership, management, nor personnel. The officers and directors are as follows: A. M. Foster, president; W. C. Forbes, secretary and sales manager, J. M. Foster, treasurer and factory manager. Associated in the management of the company are C. B. Curry, assistant treasurer and auditor, A. M. Curry, factory superintendent, R. L. Wright, traffic manufacturing and purchasing agent, and E. R. Odom, mechanical superintendent.

Barium Glass Patents Sold to National Pigments

The National Pigments & Chemical Company of St. Louis, Mo., a subsidiary of the National Lead Company, has taken over the two United States patents,[1] No. 1,665,693 and 1,665,694, issued April 10, 1928 to E. E. Fisher on the use of barium in glass.

Barium carbonate used in the manufacture of glass has heretofore been imported from abroad. The National Pigments & Chemical Company is said to possess the largest deposits of barium carbonate in the world, including deposits in Europe. In the State of Missouri the company controls many thousands of acres suitable for the production of high grade barium and on the Pacific Coast it owns what is believed to be the largest deposit yet discovered.

Mining operations have already begun in California and it is reported that shipments will begin next fall. It is rumored that one barium refining plant is now in operation at St. Louis and that another will be built on the Coast.

The National Pigments & Chemical Company also have secured the services of E. E. Fisher, glass technologist, who developed the process described in the patents mentioned above for the use of barium sulphate and barium sulphide in glass, and who will act as consultant for the Company.

It has been stated authoritively that the acquisition of the Fisher patents by the interests named above, and their plans to promote agressively the increased use of barium and barium compounds in glass were decided upon only after every phase of the matter had been minutely and thoroughly investigated by the most experienced and competent chemists and patent experts available.

[1] Reviewed in the May, 1928, issue of THE GLASS INDUSTRY.

United Feldspar Corporation Organized

The United Feldspar Corporation, 10 East 40th Street, New York, which was organized to take over several feldspar producing companies including the Tennessee Mineral Products Corporation, Spruce Pine, N. C., the Oxford Mining and Milling Company, West Paris, Maine, the Perham Crystal Feldspar Mines Oxford County, Maine and the United States Feldspar Corporation, Cranberry Creek, N. Y., announces that arrangements have been made for the Roessler & Hasslacher Chemical Company, 10 East 40th Street, N. Y., to act as their exclusive selling agents. The latter company has for some time past been marketing the Tennessee Mineral Products Corporation's materials, including "Minpro" spar and the new combination will add to their line the Oxford, Crystal, Cranberry and Kennyeto brands. This new development in the feldspar field will be advantageous to their customers, making available several new shipping points.

General Electric Marketing New Lacquers

Glyptal lacquers have been placed on the market by the merchandise department of the General Electric Company, Bridgeport,, Conn., in cans ranging from one-half pint to five gallon capacity and in 52 gallon drums. The company states that where an oil resistant, high protective durable and flexible insulating coating is demanded for industrial uses the new lacquers which are offered in a series of colors have been found superior to ordinary protective paints in that they are more easily applied, dry faster, have a more pleasing appearance and are more resistant to acids and mineral oils and less affected by high temperatures. They will stand temperatures destructive to, and have a dielectric strength greater than the commoner used paints. These lacquers may be applied by brushing, spraying, dipping, in red, blue, brown, green and aluminum colors.

Government Charges Conspiracy in Bottle Sales

Two well-known glass bottle manufacturing companies and a bottle sales agency and several distilling companies were among a list of 40 companies and 136 individuals indicted on charges relating to illicit liquor traffic by the Federal Grand Jury in Brooklyn, New York, on June 21. Indictments were

issued on various charges including the selling of bottles, cases, barrels and other equipment to Glickstein and Turner, Inc., of Brooklyn, who it is alleged sold them for distribution to smaller distributors scattered throughout the country, all the way from Boston to Los Angeles. In one case the defendants are charged with having sold empty whiskey barrels, the insides of which were later scraped. One of the charges against certain of the defendants is that they defrauded their customers through the use of bogus labels, cases, and bottles used in the sale and distribution of liquor. It is alleged by the authorities that the bottles and other containers were so marked as to make it appear that common liquors sold by the conspirators had been imported from various foreign countries. Trials will be held at a later date.

Begin Work on California Plate Glass Plant Next Fall

It has been announced that construction on the first unit of the new plate glass plant for which the Pittsburgh Plate Glass Company recently acquired a site in the city of Santa Ana, Cal., will begin about September 10. A large celebration is being planned for the ceremony of turning the first spadeful of earth. The new enterprise will put the city of Santa Ana on the glass map very prominently. The cost of the factory buildings and equipment, according to estimates, will amount to approximately $5,000,000. During the past month a sum amounting to $176,000 was paid to the landowners by representatives of the company and the deeds to the property have been filed.

Establishes Edison Fellowship

The General Electric Company, in honor of Thomas A. Edison and to commemorate the 50th anniversary of the completion of his first incandescent lamp, has established an Edison fellowship for research in the General Electric Research Laboratory at Schenectady N. Y. Arrangements will be made for promising students to spend a year at the Laboratory for industrial and scientific research to determine their fitness for following such work. A grant of $3,000 a year will be allowed. Selection of applicants will be made by the National Research Council with the advice of the Director of Research of the General Electric Company.

Decline in May Construction Record

Contracts awarded in the territory east of the Rocky Mountains during the past month amounted to $587,765,900, according to the F. W. Dodge Corporation. This amount represents a decline of 9 per cent from the preceding month and 12 per cent from May, 1928. The most significant decline occurred in the New York State and Northern New Jersey district, indicating, apparently, the influence of the recent labor dispute in New York City. In the territory outside of this district, the decline was less than 2 per cent from April of this year as compared with a normal seasonal decline from May of 4 per cent.

Scohy Sheet Glass Company Expanding

Scohy Sheet Glass Co., Sistersville, W. Va., are expending $75,000 to increase their production twenty per cent. They have let the following contracts: Tank blocks and material for drawing tank, Laclede Christy Clay Products Co., St. Louis, Mo.; blocks for melting tank (upper rows), Corhart Refractories Co., Louisville, Ky.; silica bricks, Harbison-Walker Refractories Co., Pittsburgh, Pa.; Fourcault machines, Hart Bros. Machine Co., Clarksburg, W. Va.; warehouse and cutting room, Bowser Lumber Co., Sistersville, W. Va. Thomas B. Hart, Charleston, W. Va. is in charge of tank construction

New Bottle Factory in Canada

A new glass bottle manufacturing company is being established at Winnipeg Manitoba, under the name of Midwest Glass Company. It is stated that the firm is capitalized at $500,000 and represents an actual investment of $300,000. The plant is under construction at the corner of Southerland Avenue and Anabella Street and will be modernly equipped in every respect. Two melting furnaces, one for amber and the other for flint glass, with a capacity of 18 tons each daily will be provided. Bottles, jars and other containers will be made. The silica sand supply will come from Black Island, Lake Winnipeg. Gas will be furnished by the Winnipeg Electric Company and electric power used for various purposes.

Polished Plate Glass Output Gains Over Last Year

According to figures compiled by P. A. Hughes, secretary of the Plate Glass Mannufacturers of America, the production of polished plate glass for the month of May, 1929, was 12,781,975 sq. ft., as compared to 12,554,979 sq. ft. produced in the preceding month, April, 1929. The production for the corresponding month last year, May 1928, was 10,881,834 sq. ft.

Trade Mark Registration Denied

In the case of the Ohio Hydrate and Supply Company, Woodville, O., vs. John Herzog & Sons, Forest, O., both producers of limestone products, the appellant's mark was denied registration over the registrant's mark by Assistant Commissioner of Patents Moore, who gave his decision dated June 13, 1929, confirming the decision of the examiner of trade marks.

New Bottle Factory in Sweden

During the past year a new glass bottle factory was established in Sweden at the city of Moss. It is entirely equipped with automatic American machinery and has a daily capacity of approximately 50,000 bottles.

Date Set for Laminated Glass Patent Case

The trial of the suit instituted by the Triplex Safety Glass Company of North America against the Duplate Corporation, formerly the Pittsburgh Safety Glass Company, for alleged infringment of patents controlled by the plaintiff is scheduled for trial on September 3, at Pittsburgh.

Johnston Glass Company Obtains Triplex License

The Johnston Glass Company, Hartford City, Ind., has made a license agreement with the Triplex Safety Glass Company of North America under which they will manufacture laminated glass according to the patents controlled by the Triplex company, subject to certain royalties and other conditions.

Trade Activities

The United Feldspar Corporation, New York, has moved its office from 39 Broadway to 10 East 40th Street. Their new telephone number is Caledonia 2188.

The Rolland Glass Company, Clarksburg, W. Va., resumed operations in June, after a shutdown of several weeks for repairs. The equipment of this plant includes ten Fourcault machines.

The Adamston Flat Glass Company, Clarksburg, W. Va., is operating both of its tanks, supplying twelve Fourcault machines. One tank which had been closed down for repairs was recently put back into service.

The Cameron Glass Company, Cameron, W. Va., has closed down for the summer vacation during which the tank will be rebuilt and other improvements made. The company of which J. Frank is manager employs about 75 men.

The Pierce Glass Company plant, Port Allegany, Pa., is shut down for several weeks for cold repairs following failure of the tank blocks. It is stated that the company leased an outside plant to take care of orders until repairs can be completed.

The Wightman Bottle & Glass Manufacturing Company, whose plant at Parkers Landing, Pa., was completely destroyed by fire on May 27 with an estimated loss of $250,000 have confirmed the statement that the factory will be rebuilt in the near future.

The Potomac Glass Company of Cumberland, Md. of which M. H. Sloan is president and treasurer, D. C. Sloan, vice-president, Alexander Sloan, secretary are reported in Wheeling, W. Va., newspapers to be negotiating for the removal of their plant to that city.

William Koach, of Morgantown, W. Va., and associates are reported to have purchased the old glass plant at St. Marys, W. Va. Local reports are to the effect that the pur-

pose of the purchasers is to manufacture a general line of glass products including table and decorated ware.

The Central States Glass Company, which is in the hands of a receiver, is receiving the aid of a creditors' committee appointed to cooperate with the glass company officials to rehabilitate the plant located in the West end of Toledo. Efforts are being made to arrange for the resumption of operations as early as possible.

The Warren Art Glass and Mirror Company, Columbus, O., has been incorporated with a capital of $7,000 to manufacture and deal in mirrors, medicine cabinets, art glass windows, automobile windshields, desk tops, store-front settings, etc. The incorporators are Raymond Kline, Arthur Job and W. H. Fram.

The Consolidated Plate Glass Company, Toronto, Ontario, deny a report published in a New York financial paper that the company was planning to build a branch plant in the Canadian Northwest. H. N. Loftus of the company states that they have no intention whatever of establishing any additional branches in the West.

A. B. Castator, who has been representing the Hires-Turner Glass Company has become connected with Landon P. Smith, Inc. of Newark, N. J., distributors of glass cutters and glaziers' tools. He will represent the company in the New England states and in New York state exclusive of the city of New York and the metropolitan district.

The Atlantic Glass Corporation of Newark, N. J., according to press reports will establish a new plant for the manufacture of table and stem ware at Hightstown, N. J. George J. Burch, Burch Building, Maine Street, Hightstown is interested; also Ellis Cottrell and Edward Fausak. It is said the new enterprise will employ about 75 persons.

The Pittsburgh Plate Glass Company have let the contract for the excavation and drainage of the ground on which their large new window glass plant to be constructed in Henryetta, Okla., is to stand, to the Locker Construction Company of Okmulgee, Okla. It is understood that building contracts were to be let during the latter part of July.

The Hazel-Atlas Glass Company recently announced that adjoining their plant No. 2, Kearns-Gorsuch Bottle Company, Zanesville, O., a large new paper box factory for the use of both of their Zanesville factories would be erected. Approximately 75 men and women will be employed in making cartons. The full capacity of the plant will reach about 50,000 boxes daily.

Gillinder & Sons, Tacony, Philadelphia, had a heavy fire on Tuesday night, May 28, which destroyed some of the finishing department and stock rooms, but left unscathed the factory and offices of the company so that work, it was stated, went on as usual the following morning. Adequate insurance covered the loss. The damaged departments are being rebuilt modern construction style.

Chester E. Henderson of Kokomo, Ind., chief efficiency engineer of the Pittsburgh Plate Glass Company's plant in that city is reported to have resigned and entered the services of the Libbey-Owens Sheet Glass Company at Toledo, O. Mr. Henderson had been in Kokomo for a number of years and before going to that city had been assistant superintendent of the Pittsburgh Plate Glass Company's Crystal City, Mo., plant.

R. B. Tucker, who recently resigned from the presidency of the Standard Plate Glass Company and became connected with the Rust Engineering Company of Pittsburgh has been elected to honorary membership in both Eastern and Western divisions of the National Glass Distributors Association. This action was taken in recognition of Mr. Tucker's great popularity throughout the flat glass trade and of the high esteem in which he is held by the members of the Association.

Allegheny Gas Corporation, it is reported in New York, has closed a ten year contract to supply the Owens Bottle Company and the Libbey-Owens Sheet Glass Company plants at Kanawha City, W. Va., with 1,000,000 cubic feet of natural gas a day. It is stated that arrangements were made recently with the Pittsburgh Plate Glass Company to purchase 1,250,000 cubic feet of natural gas daily from the Upham Gas Company a subsidiary of the Allegheny Gas Corporation.

Ball Brothers Glass Company, plant at Okmulgee, Okla., recently resumed operations taking on approximately 150 workers. Local newspapers report that Clarence Search, general manager of the factory, stated that the present plans are to operate the plant as long as the tank blocks last. This factory was recently purchased from the Pine Glass Corporation at a reported price $450,000 and during the past six months has been remodelled and improved with modern equipment.

S. Bryan Kneass of the Interstate Glass Company, who has been active and well known in the flat glass associations and throughout the trade, has been promoted to succeed V. Scott Walker as sales manager of the company upon the latter's resignation from the office. Mr. Kneass, who has been the New York City representative of the Interstate Window Glass Company will continue the office at 1182 Broadway. P. Y. Sharp will cooperate with Mr. Kneass from the home office at Kane, Pa.

The McDonald Glass Works, Inc., McDonald, Pa., according to the first report of its receivers, D. C. Brown and Garrett D. Bryce will have a balance for distribution to creditors of $13,152. Claims against the plant total $33,360 including $1,214 for labor, done prior to the receivership. During the receivership period and up to the time of the receivers' report they collected a total of $28,623 including the balance of $557 on hand when they took charge. Expenses for labor and operation have amounted to $14,256, leaving the balance noted above for distribution to creditors.

The Ohio Valley Clay Company, Steubenville, O., have announced that Fred D. Sandblade has entered into the vice-presidency of the company, succeeding the late C. M. Hollingsworth. The company has also added to its staff Stephen A. Mitchell who has been associated for over fourteen years with the American Dressler Tumnel Kilns, Inc., during the latter part of that period as chief engineer of the company. Mr. Mitchell has been active in the construction of practically all of the Dressler Tunnel Kilns built in the United States, an experience which will prove invaluable in his new work.

The Acme Glass Corporation at Lumberport, W. Va., whose plant was disposed of last October to the Pederson Glass Company, recently filed in the County Clerk's office at Clarksburg, W. Va., a copy of their agreement with the purchaser, filing of which had been delayed because of a six months' option, which was provided for. The agreement provided for the assumption by the new owners of bonds to the amount of $60,000 issued by the Acme concern, the payment of $10,000 of the purchase money in notes and the transfer of bonds to the amount of $10,000 to Vance L. Hornor, J. H. Knight, L. C. Oyster, J. H. Hornor and E. P. Boggess. The purchaser is given the right to exchange $50,000 of its own bonds for a similar amount of those outstanding.

The Penn Cut Glass Company, whose factory at Prompton, Wayne County, Pa., was destroyed by fire in 1925 was mentioned at the trial of Leonard Jenkins of Elizabeth, N. J., held June 18 at Honesdale Pa. Jenkins is accused of having been hired by Leon Bodie of Wilkes-Barre, president of the company to set fire to the plant and is charged with arson. Bodie, who has already confessed his part in the conspiracy, testified that Jenkins was the man hired to burn the factory and that after it was destroyed Jenkins came to him and demanded money. He was told at that time to see Wilfred Jones, Luzerne County solicitor, who has since been found guilty by a jury for his part in the conspiracy. Bodie also testified that additional insurance to the amount of $12,500 was taken out shortly before the fire and made payable to Jones. The financial difficulties of the conspirators was at the bottom of their plot.

Industrial Publication

Celite for Concrete. A 24-page pamphlet published by the Johns-Manville Corporation, New York, illustrating and describing the use of Celite (a specially prepared grade of diatomaceous silica) in concrete for constructional purposes of all kinds. The advantages of using this material in industrial and other structures of many kinds is pointed out. It is said that Celite improves the workability of the concrete and insures water-tightness, and numerous other advantages are outlined in this publication which is finely illustrated with examples of concrete structures of many different types in which Celite has been used.

Coming Meetings

The Glass Bottle Blowers' Association will hold their convention at Turner Hall, New York Avenue, Atlantic City, N. J., beginning Monday, July 8. The Continental Hotel will be the headquarters. An attendance of about 100 is expected.

Recent Deaths

John W. Kellerman

John W. Kellerman, treasurer of The Isaac Winkler & Bro. Co., Cincinnnati, O., died on Wednesday, May 29.

J. Rogers Swindell

J. Rogers Swindell, associated with the firm of Swindell Brothers, Baltimore, Md., died May 16 at the University Hospital, Baltimore, Md. He was forty years old and a son of Mrs. Ulyssia Kahler Swindell and the late J. Rogers Swindell, a member of the firm of Swindell Brothers. For several years he traveled for the firm in Cuba, Mexico and other Latin-American countries, and at the time of his death was connected with the financial department. The summer preceding the World War he attended the Plattsburg training camp, where he received a commission as second lieutenant in the Officers' Reserve Corps. Called to the service at the outbreak of the war, he went to the first officers' training camp at Fort Myer, Va., from which he graduated as first lieutenant. He was soon promoted to a captaincy and a few months later became a major, with which rank he was honorably discharged into the Reserve Officers' Corps. Mr. Swindell is survived by his widow, four children and his mother.

Leopold Mambourg

Leopold Mambourg, general manager of the Libbey-Owens Sheet Glass Company's plant at Lancaster, O., died on June 13 after a succession of paralytic strokes. Mr. Mambourg was 69 years of age and besides his widow, two daughters, three sons and fifteen grandchildren are left. Mr. Mambourg came from Belgium to the United States when a boy with nothing but his intelligence and natural ability to aid him. He obtained work as a laborer in a Pennsylvania window glass factory and soon became a leader among the many other glassmakers who at that time had come to the United States from his home country. He was connected with various glass factories throughout the Middle West and eventually went into business himself as a manufacturer of window glass at Meadville, Pa. Later he obtained control of the Fairfield Glass Company, the name of which was later changed to the Fairfield Sheet Glass Company with a license to use at Lancaster, O., the Libbey-Owens sheet glass drawing process, where a machine of that type was installed. Last year the company became a part of the Libbey-Owens Sheet Glass Company, still under the management of Mr. Mambourg. Glass men who remember Mr. Mambourg in the days before the advent of automatic glass making machinery, remember him as a strong force in the industry and state that his popularity was unbounded.

Glass Stock Quotations

Pittsburgh Stock Exchange, June 25, 1929

Reported by Moore, Leonard & Lynch, Union Bank Building, Pittsburgh, Pa.

	Bid	*Asked*	*Last*
American Window Glass Pfd. Cum.....	..	86	85
American Window Glass Machine:			
Common	..	..	25
Preferred Cum.....	..	52	50
Pittsburgh Plate Glass New.....	..	..	65
Standard Plate Glass:			
Common	..	..	5
Preferred Cum.....	..	..	17¾
Prior Pfd.....	..	..	25
United States Glass	..	12	12

Inquiries Received

For further information address THE GLASS INDUSTRY

460. Please tell us where we can obtain quartz glass and also heat resisting glass.

461. Where can we have gold lettering etched on glass?

462. Will you be kind enough to tell us who are the manufacturers of bowls and vases in heavy glass.

463. Will you kindly give us any information you can as to the ultraviolet German glass called Ultravit. Who is marketing it in this country and where can it be obtained?

464. Please advise us as to sources of supply for about 2,000 tons of cullet, clear and colored.

465. Please give us the names of any concerns in this country or Germany manufacturing a non-glare or lead sulphide mirror. We want to get in touch with someone making a product comprising a darkened metal coating to the rear surface of the mirror glass, at the same time eliminating the glare.

What the World Wants

Specific inquiries for American Goods Received in the Department of Commerce, Washington, D. C.

Germany—39162, Selenium.
Canada—39111, Glass.
Domestic—38877, Glassware.
Canary Islands—38885, Cheap glassware and earthenware.

READERS' WANTS AND OFFERS

SALES ENGINEER FOR INSTRUMENTS

WANTED: Young man with manufacturing and engineering experience in the Vitreous Enamelling Industry, to become Sales Engineer for long established manufacturer of recording instruments for pressure, temperature, electricity and motion; and automatic controllers for temperature, pressure and humidity (both air and electrically operated types). Candidates preferred who have had both industrial experience and scientific education, and who are free to travel through the great industrial districts. Highest character references required. Write, stating experience, age and salary desired, to O-6, c/o THE GLASS INDUSTRY, 50 Church Street, New York.

PRACTICAL GLASS CHEMIST

PRACTICAL GLASS CHEMIST, at present employed, desires position with progressive glass manufacturer where full responsibility can be assumed. Ten years' experience in both factory operation and laboratory control. Fully qualified to produce flint, colored and opal glasses in both pot and tank furnaces. Address: CHEMIST, c/o THE GLASS INDUSTRY, 50 Church Street, New York.

AIR COMPRESSOR

WANTED: Air Compressor, capacity 1200 cu. ft. at 50 pounds pressure. Must be in A No. 1 condition. CARR-LOWREY GLASS COMPANY, Baltimore, Md.

PRESS AND BLOW MACHINE

WANTED: Combination Press and Blow or Press Machine, for the manufacture of light-weight press articles, such as small jars from one ounce to eight ounces weight. Must be suitable for automatic operation under feeders. CARR-LOWREY GLASS COMPANY, Baltimore, Md.

HIGH PRESSURE FANS

FOR SALE: 2 American Blower Sirocco high pressure fans, size 11, type P.P., outlet 14x15, complete with ball bearings. Address inquiries—FS, c/o Glass Industry Publishing Company, 50 Church Street, New York.

NEW PROCESS OF PLATE GLASS MANUFACTURE

This invention permits a more economical and perfected manufacture of plate glass in all sizes. Intermitting method.

INTERESTED PARTIES SOUGHT

Address RS c/o THE GLASS INDUSTRY, 50 Church St. New York

Current Prices of Glass-Making Materials

May 22, 1929

Quotations furnished by various producers, manufacturers and dealers.

		Carlots	Less Carlots
Acid			
Citric (dom.)	lb.	.46	.46
Hydrochloric (HCl) 20° tanks, per 100 lb.		..	1.10
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13½
52% and 48%	lb.	.10	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	5.75
Sulphuric (H_2SO_4) 66° tank cars	ton	15.50	..
Tartaric	lb.	..	.38
Alconol, denatured	gal.	..	.52
Aluminum hydrate ($Al(OH)_3$)	lb.	.04½-.05	.05½-.06
Aluminum oxide (Al_2O_3)	lb	..	.07
Ammonium bifluoride (NH_4) FHF	lb.	..	.21-.22
Ammonia water (NH_4OH) 26° drums	lb.	.03	.03¼
Antimony, metallic (Sb)	lb.	..	.09¾
Antimony oxide (Sb_2O_3)	lb.	..	.12-.14
Antimony sulphide (Sb_2S_3)	lb.	..	.14
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.04	.05
Barium carbonate ($BaCO_3$)			
Precipitated	ton	57.50-59.50	60.00-61.50
Natural, powdered, imported	ton	45.00	50.00
Barium hydrate ($Ba(OH)_2$)	lb.	..	.04¾-.05½
Barium nitrate ($Ba(NO_3)_2$)	lb.	.08¼	.08½
Barium selenite ($BaSeO_3$)	lb.	..	..
Barium sulphate, in bags	ton	28.00-35.00	..
Barium sulphate, glassmaker's, carlots, bulk, f.o.b. shipping point,	ton		16.00
Bone ash	carlots, lb.	.06	.06½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.02½-.02¾	.02¾-.03¾
Boric acid (H_2BO_3)	lb.	.05½-.05¾	.06-.07
Refined	lb.	.05½-.05¾	.06-.07
Cadmium sulphide (CdS)—			
Red	lb.	..	1.20
Orange	lb.	..	1.00-1.25
Yellow	lb.	..	1.20-1.40
Chromium oxide (Cr_2O_3)	lb.	.24	.25
Cobalt oxide (Co_2O_3)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	..	.30
Black (CuO)	lb.	..	.25-.30
Black prepared	lb.	.	.30
Cryolite ($Na_3Al\ F_6$) Natural Greenland Kryolith)	lb.	.09	.10-.10½
Artificial or Chemical	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		..	1.15-1.20
Feldspar—			
100 mesh	ton	11.00-12.50-20.00	15.50-22.00
80 mesh	ton	11.00-11.75	14.50
40 mesh	ton	11.00	13.50
Fluorspar (CaF_2) domestic, ground, 95-98% (max SiO_2, 2½%)			
Bulk, carloads, f.o.b. mines	ton	32.50	..
In bags or barrels	ton	36.50	41.50
Formaldehyde	lb.	..	.09½
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.03¼-.03½
Black (FeO)	lb.	.03½	..
Kaolin (f.o.b. mine)	ton	9.00	..
English, lump, f.o.b. New York	ton	14.50-25.00	24.50-30.00
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb	..	..
Lead oxide (Pb_3O_4) (red lead)	lb	.09½	.10½
Litharge (PbO)	lb.	.08½	.09½
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	9.50-11.50	..
Burnt (CaO) ground, in bulk	ton	8.00	..
Burnt, ground, in paper sacks	ton	10.00-11.00	..
Burnt, ground, in 250 lb. bbls.	Per bbl.	2.15-2.25	2.30-2.60
Limestone ($CaCO_3$)		2.00-2.50	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.06	.07
light (in bbls.)	lb.	..	.23
extra light (in bbls.)	lb.	..	.37
Magnesium carbonate ($MgCO_3$)	lb.	.06	.07
Manganese 85% (MnO_2)	lb.	.04	.04½
Nickel oxide (Ni_2O_3), black— for nickel content	lb.	..	.35
Nickel monoxide (NiO), green— for nickel content	lb.	..	.35-.35½
Plaster of Paris, bags	ton	..	23.00-29.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.09	.09¾
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.06½	.07
Hydrated 80-85%	lb.	.05¾	.06¼
Potassium chromate (K_2CrO_4)	lb.	..	.23-.32
Potassium hydrate (KOH) (caustic potash)	lb.	.07½	.08
Potassium nitrate (KNO_3) (gran.)	lb.	..	.05⅞-.06
Potassium permanganate ($KMnO_4$)	lb.	.16	.16½
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.23
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4)	ton	22.00	..
Selenium (Se)	lb.	..	1.90-2.00
Silver nitrate ($AgNO_3$) (100 oz.)	per oz.	..	.36½
Soda ash (Na_2CO_3) dense, 58%—			
Bulk, on contract	Flat per 100 lb.	1.22½	..
In barrels	Per 100 lb.	1.55-1.57½	1.80
In bags	Per 100 lb.	1.37½-1.40	..
Spot orders	.025 per 100 lbs. higher		
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.07	.07½
Sodium hydrate (NaOH) (caustic soda) Solid	Per 100 lb.	2.90	..
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03⅞	.04½
95 per cent	Per 100 lb.	2.17½	2.50
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.05	.05½
Sodium uranate (Na_2UO_4) Yellow or Orange	lb.	..	1.50
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.45	3.80-4.00
Flowers, in bags	Per 100 lb.	3.10	3.45-3.65
Flour, heavy in bbls.	Per 100 lb.	2.85	3.20-3.40
Tin chloride ($SnCl_2$) (crystals)	lb.	.39	.37½
Tin oxide (SnO_2) in bbls.	lb.	..	.54
Uranium oxide (UO_2) (black, 96% U_3O_8) 100 lb. lots	lb.	..	1.50-2.00
Zinc oxide (ZnO)	lb.	.08½	.12
American process, Bags	lb.	.06½	.07
Zircon			
Granular (Milled .005-.02c higher)	lb.	.07	.07½-.08
Crude, Gran. (Milled .005-.02c higher)	lb.	.03½	.04-.05

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to May 24, 1929

	April 1928 Quantity	April 1928 Value	April 1929 Quantity	April 1929 Value	Four Months Ending April, 1928 Quantity	Four Months Ending April, 1928 Value	Four Months Ending April, 1929 Quantity	Four Months Ending April, 1929 Value
Glass and glass products (total)	.....	$829,918	.....	$948,819	.....	$3,107,616	.....	$3,672,836
Plate and window glass—								
Window glass, common, box 50 sq. ft.	811	3,331	3,493	15,197	5,050	30,828	7,395	39,776
Plate glass, unsilvered, sq. ft.	221,994	68,527	172,567	53,372	655,977	232,375	784,974	270,462
Other window and plate glass lbs.	211,091	22,736	455,515	44,402	1,068,377	135,799	1,703,184	174,205
Glass containers (bottles, vials and jars)	.....	292,473	.....	299,882	.....	1,043,475	.....	1,118,021
Table glassware, plain	.....	110,780	.....	161,762	.....	431,419	.....	530,120
Table and other glassware, cut or engraved	.....	7,602	.....	14,923	.....	37,206	.....	38,973
Lamp chimneys and lantern globes lbs.	192,364	37,490	130,597	26,597	680,087	137,406	538,206	116,023
Globes and shades for lighting fixtures lbs.	154,943	59,722	171,086	65,385	544,691	202,974	695,484	258,934
Chemical glassware lbs.	24,043	20,680	16,250	18,266	72,841	62,894	79,313	75,040
Electrical glassware, except for lighting lbs.	681,892	56,548	643,726	46,584	1,913,147	148,835	2,493,000	183,352
Other glassware	.....	150,029	.....	202,449	.....	644,405	.....	867,930

IMPORTS

Corrected to May 24, 1929

Glass and glass products	.....	1,149,385	.....	993,470	.....	4,375,018	.....	4,151,811
Cylinder, crown and sheet—								
Unpolished, not bent, obscured, beveled, etc.—								
Weighing less than 80 pounds per case dut. lb.	3,707,320	109,844	3,122,078	75,536	12,653,355	366,107	12,881,858	337,733
Weighing 80 pounds or over per case dut. lb.	3,391,788	137,955	2,685,206	98,665	11,554,527	503,980	11,171,551	400,341
Polished and bent, obscured, beveled, colored, etc., unpolished and polished, and all silvered dut.	.....	46,434	.....	54,522	.....	152,649	.....	205,840
Plate glass—								
Polished, unsilvered dut. sq. ft.	1,454,580	332,808	446,853	118,169	5,074,325	1,116,085	3,860,696	852,110
Other dut. sq. ft.	74,257	16,771	177,866	30,412	353,519	83,262	482,784	93,324
Bottles, vials, jars, demijohns and carboys, molded or pressed dut.	.....	9,679	.....	20,081	.....	68,238	.....	94,584
Table and kitchen utensils dut.	.....	24,305	.....	25,929	.....	84,837	.....	77,521
Glassware, cut or decorated dut.	.....	181,842	.....	200,398	.....	768,247	.....	845,454
Blown glassware, n. e. s.—								
Bottles, ornaments, gauge glasses and other n. e. s. dut.	.....	52,248	.....	115,573	.....	249,729	.....	260,683
Bulbs for electric lamps dut. No.	1,209,549	12,178	1,459,932	13,706	4,550,705	47,477	7,078,015	58,671
Chimneys, globes, shades, prisms and other illuminating glassware dut.	.....	81,126	.....	76,006	.....	295,641	.....	324,336
Articles and utensils for chemical, scientific, and experimental purposes dut.	.....	45,126	.....	53,890	.....	173,341	.....	176,694
Other glassware dut.	.....	99,069	.....	110,583	.....	465,425	.....	424,520